REPORT

OF

THE COMMITTEE OF ENQUIRY

ON

DURGAPUR STEEL PLANT

(Hindustan Steel Ltd.)

April, 1967

GOVERNMENT OF INDIA
MINISTRY OF STEEL, MINES AND METALS
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CHAPTER I

INTRODUCTION

1.01 The Government of India, in the Ministry of Iron & Steel, by Resolution No. DUR-21(4)/66, dated September 12. 1966 set up a One-man Committee consisting of Shri G. Pande, then Vice-Chancellor of the Roorkee University, to conduct an expert review of the shortcomings in the performance of the Durgapur Steel Plant, particularly in the two units of the Coke Ovens and the Wheel & Axle Plant.

1.02. The Government asked the Committee to indentify and assess the deficiencies and ascertain the causes therefor, in the particular units of the Coke Ovens and the Wheel & Axle Plant as well as in the allied departments, which may have contributed to these deficiencies. The Committee was also directed to assess the overall performance of the Steelworks and recommend steps necessary to secure rapidly full and efficient performance, additionally to action which the HSL may already have taken. The resolution published in the Gazette of India Extraordinary Part I Section (i) on the 13th September is reproduced in Annexure I-A.

1.03. The Committee carefully considered its terms of reference and concluded that it would have discharged its functions fully by confining its enquiry primarily to the technical aspects of what has been or still is deficient in the Coke Ovens and the Wheel & Axle Plant specifically and in the Steelworks generally at the 1-million tonne stage, and to make necessary recommendations to correct the deficiencies and further that the Committee was not required to go into the question of fixing responsibility on individuals for these shortcomings. The enquiry has been conducted accordingly.

1.04. The Committee could not start the work before November 1966. It also found that the scope of the Resolution was so wide that it would be necessary for considerable data to be collected from the Durgapur Plant and elsewhere. Visits were also considered necessary to the other HSL Plants and other Steelworks in the country and to a few other Government industrial concerns. Since the work could be undertaken only on part-time basis, a request was made to the Government for extending the date of submission of the report up to the 31st March, 1967. This request was accepted. In the final typing of the report and getting together the annexures, it has taken a few days more. This small delay has been unavoidable.

1.05 The Committee spent a large portion of its time at Durgapur. Visits were also paid to HSL, Ranchi and all the other Steel Plants. Industrial concerns like Chittaranjan and Sindri were also visited as also the Steel Plant being set up at Bokaro. The Committee had discussions at Delhi with officers of the Ministry of Iron & Steel and the Railway Board, at Lucknow with the Director General, R. D. S. O. and his officers. At Calcutta the Committee met the Chief Sales Manager and other officers of HSL, the Iron & Steel Controller, the Secretary of the J.P.C., the two Railways General Managers and some big and small consumers. Discussions were also held with the Director, Central Fuel Research Institute at Jealgora and the Director of Central Mechanical Research Institute at Durgapur. The Committee also met some top Union leaders at Durgapur.

1.06. The Committee issued a set of questionnaires to the General Manager and his other Heads of Departments through him. The replies received were discussed with the officers concerned. Some similar procedure was observed in the case of some others consulted by the Committee. Some notes were also taken in the course of personal discussions as neither there was time nor was it considered necessary to record such evidence. In the case of consumers they invariably desired to maintain their annonymity for business considerations.

1.07. The report has been written with a view to bring out mainly the technical aspects of the problems involved and a similar approach has been used, as far as possible, in regard to the recommendations made. It has, however, not always been possible to confine the treatment to a technical appreciation only. Even in very highly sophisticated technical processes, the human element plays the most essential part and therefore, there have been some inevitable references to this aspect also.

1.08. The Committee during its stay at Durgapur took the opportunity of bringing to the notice of the Management some ideas and suggestions for effecting improvements. These were well received and necessary action was initiated by the officers concerned.

1.09. The Committee has received the utmost assistance from the management of the Durgapur Steel Plant and the best co-operation from all others at the HSL Headquarters and its other Plants and Organisations. It was also the recipient of the best consideration from all others contacted by it. Shri Rajendra Singh, Additional Chief (DPD), HSL, Ranchi who was deputed by the Chairman to help the Committee has worked continuously for very long hours and rendered invaluable expert advice and assistance. The small secretariat staff including the Stenographers taken on loan from the HSL have been ungrudging in doing their allotted tasks. The Committee is much beholden to everyone with whom it had to deal.

CHAPTER II

BACKGROUND

2.01. The Durgapur Steel Plant of 1 M.T. ingot capacity has been set up at Durgapur, (West Bengal) at a total cost of Rs. 205·2 crores including a foreign exchange component of Rs. 102·9 crores. The cost of the township with 7,500 housing units including land was Rs. 17·3 crores. The annual capacity and product-mix for the 1 M.T. are given below:—

(in '000 tonnes)

Ingot steel	1,016
Pig Iron for sale	300
Semis for sale	238
Sleepers	61
Wheels & Axles	57
Fish Plates	11
Light & Medium Sections	203
Merchant Sections	244
Total saleable steel	814

A flow chart of the 1 M.T. Plant is at Annexure II-A.

2.02. The entire work of design, supply, erection and commissioning was entrusted to a consortium of 13 British firms known as the Indian Steelworks Construction Co. Ltd. (ISCON). The consortium entered into a contract on the turn-key basis, with the Government of India, on 31st October, 1956. M/s. International Construction Co. (ICC) were appointed, under contract, to act as Consultants for the Project and supervise the work of M/s. ISCON. In April 1957, the Government of India transferred the Project to the management of the Hindustan Steel Ltd.

2.03. The work was divided into four stages. The I stage included five main works needed for the commissioning of one Coke Oven and one Blast Furnace; the II stage included a second Coke Oven and a Second Blast Furnace with 3 Open Hearth Furnaces, the Blooming, the Intermediate and the Billet Mills as also the Sleeper Bar Plant; in the III stage came the third Coke Oven and third Blast Furnace together with 4 O.H. Furnaces and the Section and Merchant Mills and finally the last O.H. Furnace and the Wheel and Axle Plant were commissioned in the IV stage. The units of the I stage were to be completed by 31st October, 1959, II stage by 30th April, 1960, III stage by 30th April, 1961 and the IV stage by 31st July, 1961. Due to various difficulties encountered by the contractors and the management, delays took place in completing, taking over and commissioning of a number of the units. These delays ranged up to 13 months. However, iron making started by December 1959, Steel making by April, 1960, steel rolling a month later. By May, 1961 all the rolling mills had started working and finally the Wheel and Axle Plant was commissioned in January, 1962. When the financial year 1962-63 commenced, all the main sections of the works had been commissioned except that the last Coke Oven, Blast Furnace and O.H. Furnace came into operation up to 2 months later.

2.04. Due to various reasons the production was somewhat slow to catch up with the rated capacity. Whereas coke production had already reached the target during 1962-63, Blast Furnace Production at the end of this year touched 90 per cent, the Steel Melting Shop reached 72 per cent, the Blooming, Billet and Section Mills gave between 60 to 70 per cent, the Merchant Mill 45 per cent and the Wheel and Axle Plant only about 36 per cent of the rated production. The total saleable steel produced during this year was about 60 per cent. The production recorded for main products from year to year has been given in the Statement in Annexure II-B.

2.05. The slow pace of development of production in some of Steel Plants of the Hindustan Steel Ltd. was adversely commented upon in the Parliamentary debate held in the Lok Sabha in May 1962. The then Minister for Steel and Heavy Industries dealt with these questions in some detail and also indicated his general policy with regard to the development of heavy industries in the country.

An indication was also given that further thought was being given to the matter by him. This was followed by a detailed statement by the Minister in the Lok Sabha on September 20, 1963, on the management of Public Sector enterprises, wherein certain main policy decisions were given for the running of the Steel Plants and on their relationship with the Ranchi Headquarters organisation of the Hindustan Steel Limited, the powers of which were also defined. These statements have been dealt with in more detail in the next chapter.

2.06. This chapter which deals with the background will not be complete unless mention is made of the expansion programmes of the Durgapur Steel Works. The first stage of development known as the 1·6 MT stage began in January 1963 and envisaged an increase in the capacity of the Steel Works from 1·016 million ingot-tonnes to 1·6 million ingot tonnes. This work was undertaken at a total estimated cost of Rs. 69·1 crores, with Foreign Exchange Component of Rs. 25·4 crores. A number of British contracting firms supplied the equipments and also undertook their erection.

2.07. In the 1·6 MT stage (flow chart at Annexure II. C) provision had been made for a new Coke Oven Battery, a Sintering Plant, a new Blast Furnace, a new Pig Casting Machine, a new O.H. Furnace, six new Soaking Pits and a new Skelp Mill. Some additions were also contemplated to the Wheel and Axle Plant, the existing Steel Mills, the Foundry and the Shops, and the Power and the Oxygen Plants. Additional equipment and facilities have also been provided for, in many sections of the Steel Works, for removing some previous shortcomings and for handling the additional work involved on account of the expansion. Generally speaking, deliveries of equipment have been delayed but by now almost all equipments have arrived. The erection of structures, plant and equipment has kept pace with the deliveries. The present position is that the Blast Furnace, the Coke Oven, the Dolomite Plant, the Sintering Plant and the O. H. Furnace have been completed. The Skelp Mill is about three-fourth ready. The work has been somewhat behind the original targets some of which have been revised for various reasons. Except for the pig casting machine, none of the main units have yet been commissioned. This matter does not strictly fall within the terms of reference of the Committee but has been mentioned in passing because many of the facilities provided in the 1·6 MT expansion are such as remedy some of the bottlenecks of the 1 M.T. stage and, therefore, if the works had been completed as scheduled, they would have been of assistance in increasing the production of the various sections of the Steelworks.

20.8. It may also be added that in the context of the Coke Oven troubles, if the 4th C.O. Battery provided at the 1·6 MT stage had been commissioned in time, the production at Durgapur would not have suffered and the losses on this account would have been reduced to a very large extent.

2.09. The detailed project report for 3·4 M.T. expansion was prepared by the Central Engineering and Design Bureau (CEDB) and the British Steel Works Equipment Limited, London (BRISEL) has submitted the tender a few months back. They have also offered to enter into an agreement with the Hindustan Steel Limited to provide, execute and complete the works under terms and conditions and prices specified by them. The main works envisaged are 2 Blast Furnaces, 3 Coke Oven Batteries, 3 L.D. Convertors, a Slabbing, a Hot Strip and a Cold Rolling Mill, 20 nos. Soaking Pits, and additional facilities for running them. This offer is under consideration.

2.10. All that the Committee would like to mention in this connection is that great care has to be exercised in avoiding the difficulties that were met in the implementation of the previous contracts for the 1 MT and 1·6 MT stages. Another point to be seriously considered is whether the time is ripe for going in for further expansion at Durgapur without the plant having established economical and optimum production corresponding to the 1·6 M.T. stage. It is also for the consideration of the Government whether Durgapur expansion should be so programmed that the maximum content of indigenous know-how and equipment are utilised, which it is expected will have developed considerably during the next few years. This may reduce the overall cost of expansion and also save valuable foreign exchange. In this context it is also hoped that if the contract is given to the consortium, it should not be left to them to decide as to what indigenous know-how and indigenous production capacity they will utilize but the HSL should positively indicate these to them.

CHAPTER III

REORGANIZATION

3.01. The Minister for Steel and Heavy Industries, who had taken over charge of the Ministry two months earlier, in his reply to a Parliamentary debate on 17th May, 1962, dealt with the many points raised in the course of the discussion and showed his concern at the limping of the HSL steel plants towards their production targets. He also indicated how the Public Sector could function effectively and efficiently. Wide autonomy was envisaged not only for the Hindustan Steel Limited but for the Plants also. Mention was also made of giving entire responsibility to the man-in-charge of the Plant and 'if he could not deliver the goods within a reasonable time, there would be no option but to remove him. Younger men even at some risk were to be given responsible positions.' In his view, there should be no ground for conflict between the employer and the employee in the Public sector and running them should indeed be a cooperative effort.

3.02. Sixteen months later, on September 20, 1963, the Minister made a detailed statement in the Parliament on the management of Public sector enterprizes. In this, he indicated that he had already reorganised the Board of Directors of the Hindustan Steel Ltd., to make it more a policy making and less an operating body and that larger delegation of authority had been made to the Plant General Managers.

3.03. In this statement, the Minister had dealt with the problems of Durgapur and Sindri in particular and suggested ways and means of improving their production and efficiency. He had left it to the Board of Directors of Hindustan Steel Limited to decide whether similar changes, with modifications as necessary to suit local conditions, might be introduced in Rourkela and Bhilai also.

3.04. Since efficient production at tolerable costs depended exclusively upon good management, the proposed changes placed a larger measure of operating authority at the Plant level and minimised the need of scrutiny by the HSL and the Ministry. Thus, a high degree of antonomy was given at the Plant level reserving to HSL the functions of broader policy making and providing to the steel plants the necessary advisory and consultative staff services. The authority to appoint, promote and discharge persons within the Plant organisation was placed at the Plant level, the General Manager being free to delegate to the other heads of units the appropriate sub-responsibilities. The General manager remained responsible to the Board of Directors and the Chief Executive at HSL (Ranchi) for the efficient operation of his Plant. The General Manager was given the authority to hire, fire and promote freely from one grade to another and the power to give advance increments, without prescribing any time limits or placing emphasis on seniority alone for such promotions. The Minister did not consider that it was wise to prescribe rigid categories for workers and for supervisors.

3.05. The responsibility for timely purchases of replacements and stores was squarely placed on the General Manager and it was not obligatory for him to consult the Finance in these matters. The Minister also envisaged different specialised bonus schemes for the different plants particularly fitted to their needs.

3.06. A new office of Commercial Manager was to be established to be filled by a person with proper experience and qualifications. He would be responsible for maintaining good liaison between sales and production and be able to reconcile the differing attitudes between the production men on the one hand, who are naturally desirous of producing the items and quantities which can be run at the lowest cost, and the sales organisation on the other hand, which would naturally be inclined to accept each and every order obtainable. It was also envisaged that the Purchase Officer would report to the incumbent of this new post.

3.07. The Minister also desired that a more highly specialised and experienced talent should be brought to the office of the Personnel Manager who must discharge efficiently the staff function of being an adviser to the General Manager and the Line Supervisors. The tendency of the Personnel Managers to consider themselves as administrators of personnel rules and regulations, emanating from some higher authority and often at variance with the judgement of experienced line operators, had to be changed.

3.08. The Plant financial Advisor and Chief Accounts Officer's functions were also defined as being of an advisory nature with a view to assist the General Manager with internal plant accounting, cost accounting and financial advice and that his was to be a staff and not an operating function. He was to be one of the trusted lieutenants of the General Manager but the General Manager was not bound to ask for his advice or to abide by it.

3.09. While spelling out in some details the proposed changes at Durgapur, the Minister laid stress on the excessive manpower employed in the plants as the manning per ton of product was several times more than in comparable operations abroad. He depricated the heavy unauthorised absentism and excessive authorised leave and desired that the procedures in regard to these matters should be tightened.

3.10. In concluding his statement, the Minister said that his intention was to give the Management a free hand to run the Plants according to those principles of industrial management which have proved successful all over the industrial world and the General Manager and his operating staff must be left free to devote their entire time to the efficient running of their units. These would mean departure from many old ways. Above all, it must be remembered that industrialisation involved risks.

3.11. The Hindustan Steel Ltd. considered in detail the action to be taken on the Ministers pronouncement and thought it desirable to delegate the same powers to all the three General Managers subject to the provisions of Indian Companies Act, the Memorandum and Articles of Association of the Company and subject to the provisions of codes, rules and regulations and policies prescribed by the Board from time to time. The Board delegated very wide powers to the General Managers as effective from 5th October, 1963. The powers so delegated were fully in keeping with the spirit of the pronouncement made by the Minister.

3.12. The rise in production at Durgapur after the reorganisation was quite rapid as will be seen from the statistical data given in Annexure II-B. In its zeal to increase production, the Durgapur management seems to have neglected many essential responsibilities which are incumbent for good performance. Mention may be made of neglect of proper maintenance, lack of rigid control on the quality of products and to an extent inattention to staff indiscipline and building up of staff competences. These will appear in their proper context in later chapters.

3.13. In the scheme of things, the authority of Hindustan Steel Ltd., at Ranchi was severely curtailed with the result that except for high policy decisions taken at the Board level which were binding on the Plant Managers, no substantial or effective authority was left with the HSL to coordinate the work at the plant level or to offer general or technical advice unless asked for. In any case, the functional Directors having been removed from the HSL, higher technical advice could not have flowed from the Headquarters. No doubt, a Financial Adviser and a Technical Adviser were given at the Headquarters, the latter is no more there, but their functioning was perhaps rendered ineffective for one reason or the other mainly because they could have functioned only if and when any advice was required by the Plant. As matters stood such advice was heardly demanded or was welcomed.

3.14. In the personnel sphere too all coordination between the different plants vanished and there was no interchange of personnel at the higher levels and inbreeding was the inevitable result.

3.15. The Committee cannot help remarking that on the whole the reorganisation and overhaul of the functions of the HSL and the Plants, though well-intentioned, did not bring about the results that were anticipated in the case of the Durgapur Plant, as subsequent chapters will indicate.

CHAPTER IV

DEVELOPING PERFORMANCE

4.01. It will not be out of place at this stage to describe briefly what should be regarded as good performance and what factors lead to good and efficient production in a steel Plant. Usually profitability is the index used for distinguishing good performance from an indifferent one. But profit is an end product of several factors depending on the type of industry and the nature of its products. Therefore, it would not be rational to compare one Organisation with another on the basis of profit alone. Good performance, however, usually enhances the profitability of the concern and also enables the attainment of the objectives of the enterprise. It would mean that by employing, within the facilities provided, the resources of men, equipments, and materials, through well recognised and efficient processes, the enterprise is able to produce goods and services in the prescribed quantities and in a predetermined order in keeping with real customer demand and further that it is in a position to sell the products to the satisfaction of the customers without having to accumulate large stocks.

4.02. Effective performance in any enterprise depends upon a variety of complex factors some of which may not lie within the control of the management, e.g., market and economic conditions, pressures from the community labour legislations, union rivalries etc. All good managements, however, lay down certain basic foundations upon which the edifice of efficient performance is built, maintained, and gradually improved. Experienced managers are mostly aware of these principles and practices and there is also a good deal of management literature available on the subject. Even though it may be a case of emphasizing the obvious, the Committee would wish to recapitulate some of them before proceeding to study the situation at Durgapur.

4.03. It is advantageous for an Organisation, as far as possible, to conduct its working by written down systems, known fully to all concerned and observed by them. This is the best way to create and maintain technical and managerial discipline in a Plant.

4.04. The following systems are found useful in practice :

(i) To define duties, responsiblilities and powers at all levels, and to make these known to the staff concerned. This may take the form of an Organisational manual.

(ii) To lay down detailed instructions for the correct operation of the Plant. These may be in the form of Instruction Booklets or Operation Manuals. The plant suppliers usually supply many of these.

(iii) To introduce a regular system of inspection of plants, equipments, structures, buildings etc.

(iv) To prescribe the correct type of preventive maintenance and issue maintenance manuals. Thereafter make the required programmes and proper schedules for each of the plants and equipments and meticulously follow them.

(v) To present the right type of instructions for handling, weighing and checking quality of incoming materials and for their storage and their preparation and processing.

(vi) To ensure that the requirements of raw and other materials, services, spares, etc. are available to the work centres in required quantities, of right quality and in correct sequence.

(vii) To prescribe in detail procedures for inspection and quality control of products at all points upto the final stage.

(viii) To ensure that information on plant performance and other aspects flows unrestricted and truthfully to one central point which should function as the management's braintrust.

(ix) To create a system whereby performance assessment in all vital areas is done as a regular routine and the management is enabled to manage by principle of exception.

(x) To establish long and short term assignments for improvements in all spheres, in working methods and practices, optimum utilisation of various resources, control on wastage and rejections.

(xi) To tap the ideas and knowledge available with those who are engaged on production activities at all levels by creating a spirit of enquiry, innovation, and challenge in the organisation.

(xii) To delegate adequate authority and powers, commensurate with the responsibilities to staff at all levels with a view to enable them to perform the duties assigned to them.

4.05. A man will do best in locations where there is the greatest scope for using his talents and abilities and opportunity is freely available for growth and for superior performance. Therefore, correct placement of individuals, workers or supervisors, in suitable positions and a constant review of such placements are essential.

4.06. The human material is, by and large, capable of very rapid development. Therefore, the emphasis in the Organisation should be to build up know-how, skills and competence amongst all the employees, workers, supervisors as well as managers rather than carry on by an elimination of the incompetent ones. Everyone should be aware of the line of his advancement and how he can go up with his own efforts. Payment should be commensurate with work and incentives should be real inducement for more production. No short term pampering like heavy overtime should be resorted to.

4.07. With the level of education and general consciousness improving fast all round, the days of achieving good performance through fear are of only historical interest now. Therefore, a sense of responsibility and discipline has to be inculcated in the men. This can be achieved by spelling out for each job what specially is the contribution expected of the worker and by giving him all the information that he may need for the purpose, including how his work may affect the work of others in the organisation. The management, in its turn, must set for itself a high standard for its own performance and set correct examples by word and deed.

4.08. The Management must be consistent in dealing with the employees and not discriminate one employee from another. Nothing does more damage to an organisation than even a lurking fear or suspicion that the decisions of the management may at times be coloured. The machinery for assessing staff grievances must, therefore, be an efficient one and its functioning above board.

4.09. The time available at the disposal of the supervisors and managers must be properly rationed between field work, office work, meetings, work in the areas of planning and improvements of performance.

4.10. A realisation has to be built in everyone's mind that profit making is essential for the livelihood of the employees and for building their future as salaries, wages, and other amenities and conveniences cannot be paid out of the fixed assets represented by plant, equipment, buildings and property. Profit therefore, must be made if the industry is to exist and profit comes only from efficient production. Although the aim of establishing steel industry in India was primarily to build a strong industrial base for heavy industrialisation, the accent throughout the entire organisation must be towards economy and efficiency in operation and management and profitability of the enterprise.

4.11. An organisation has constantly to be looking at other organisations performing similar functions. From those engaged in research and development activities, one has to obtain their assistance and cooperation in solving problems of technology, engineering and management and in improving techniques and attaining higher levels of performance. Outside help should not only be welcome but should be purposefully sought and made use of. However, it should not be at the cost of development of local talent or use of internal facilities.

4.12. In the final analysis, no system can produce results by itself and the most important factors are the willingness, ability and competence of the men in the performance of the tasks allotted to them. This can best be ensured by proper leadership and fostering proper morale.

CHAPTER V

OVERALL PLANT PERFORMANCE

5.01. In measuring the overall performance of a Steel Plant, several indices have to be used covering the various areas of management, *viz.*, plant operation, personnel, costs, etc. Some of the indices, however, are not always quantifiable and even if they are, it may not be possible to derive valid conclusions therefrom. The process of measurement usually involves reference to a predetermined standard, but in the absence of norms and standards covering various fields of activity in an integrated steel plant, one has to judge by trends and a comparison with plants engaged in similar activity.

5.02. Since some of the important units at Durgapur were commissioned only by the middle of 1962, the Committee considered it reasonable to study the performance of the Plant as a whole commencing from the year 1963-64, by which time the plant would normally be expected to be working to its rated capacity. It may be observed that although monthly rated capacities were reached in respect of several units by 1963-64, the annual rated capacities were not achieved in respect of many finishing units even during this year.

5.03. Some important performance indices and figures taken from Annexure V-A are given below:—

Item	1963-64	1964-65	1965-66	1966-67 (3 Qrs.)
%Achievement on rated capacity : .				
(*i*) Coke . .	102	100	95	64
(*ii*) Hot Metal .	101	102	100	70
(*iii*) Ingot . .	96	99	99	71
(*iv*) Finsihed Steel	89	89	84	67
Cost of Production—Rs./tonne.				
(*i*) Coke . .	57·03	62·22	68·22	78·19
(*ii*) Hot Metal .	134·43	134·27	152·67	167·93
(*iii*) Ingot . .	216·04	227·43	251·72	290·20
Mintenance cost—Rs. lakhs . .	476	562	609	367
Overtime payments—Rs. lakhs. . .	53	76	106	55
Productivity :				
(*i*) Ingot Steel man year in works/tonnes	73	68	67	48
(*ii*) Material Productivity	0·28	0·28	0·27	0·27
Profit (+) .	..	53	..	..
Loss Rs. lakhs(—) .	19	..	231	1,033

NOTE: The figures under 1966-67 are for 9 months only and the position for the whole year will be somewhat different.

5.04. Annexure V-B gives the names of the senior officers including the heads of operation and maintenance departments of the works, who were in position at Durgapur from 1960 onwards.

5.05. Ignoring the performance of the Plant during the year 1966-67, which has been an abnormally bad year for the Durgapur Steel Plant, a study of the above table would indicate that whereas the ingot steel production had been near the rated capacity of the Plant till 1965-66, the achievement in terms of finished saleable steel has always lagged behind. This is mainly because of low utilization of the Mills due to heavy delays and inadequate soaking pit capacity. This led to the building of a stock of 112,000 tonnes of ingots as on 31st October, 1966 valued approximately at about Rs. 2·8 crores. In terms of quality, the off-grade production at the Steel Melting Shop has been of the order of 15% and at the Mills about 20%. These are high figures indeed. Even though the off-grade quality sells well in the market at present owing to a heavy differential in price, the production of off-grade cannot be taken as a normal feature of the plant operation. This indicates the need for better control over quality of materials, processes and products.

5.06. The inventory of finished and semi-finished goods has been steadily rising and its value in 1965-66 was twice as compared to 1963-64. The rising stocks of ingots and sleepers and the stocks in stock-yards have been the main contributory factors in this abnormal rise.

5.07. The cost of production has also been steadily rising being highest in 1965-66. Similarly the maintenance cost as also the overtime payments were the highest during 1965-66. It is, however, a normal feature of maintenance that as the Plant advances in years, it requires more and more effort and expenditure to maintain it. However, the quantum of additional expenditure may still require looking into. The heavy overtime payments at Durgapur in the past, inspite of quite of liberal labour force, had been the subject of criticism in the past and it is a happy augury that effective action has been taken and the overtime payments drastically reduced during 1966-67.

5.08. The labour productivity has been steadily falling and if the incidence of overtime is converted into equivalent number of men employed, the fall in productivity has been rapid, specially during 1965-66. Rising labour productivity is fundamental for the survival of the undertaking and, therefore, the management must devote maximum attention to this very unfavourable feature. The productivity indices for 1965-66 for the other plants have been of the order of 70 tonnes per man year in the Works against 67 at D.S.P. The control over absenteeism and executive/labour turnover will also tend to reflect in better productivity.

5.09. The material productivity, *i.e.,* the ratio between the ingot production to all raw materials used, has been more or less steady. However, since the cost of raw materials constitutes about 30% of the total cost of production, economy can be effected by reducing the usage of materials for every tonne of steel produced. This can be done by establishing progressively stricter consumption norms for attainment over the years, by exercising due care in the storage, blending and use of materials, cutting down losses, and by improving the operating practices.

5.10. After having entered the profit zone in 1964-65, Durgapur slipped back and incurred a loss of Rs. 2·31 crores during 1965-66, which is expected to rise substantially to over Rs. 13 crores during the year 1966-67. The main cause of this heavy loss is the near disaster that overtook the Coke Ovens which resulted in severe curtailment in Coke production and C.O. gas, which again slowed down production in all departments. The estimated loss for 1967-68 is of the order of Rs. 10 crores. Losses in future years must surely come down keeping in mind that 1966-67 has been an abnormal year for Durgapur but the monthly trend in production during 1966-67 has shown considerable improvement towards the end. It will, however, be observed that generally 1965-66 was itself a bad year from the point of view of performance, costs, and productivity.

5.11. In all 27 equipments and attachments were out of commission or lying idle in March, 1967 in the plant. It is not possible to get an idea of the cost of equipments lying idle since figures were not available for all idle equipments. It was stated by the Plant management that out of these 27, 13 are redundant to their requirements, 9 of them are idle owing to maintenance difficulties, 4 of them because of inadequate design and one is idle because it is not economical to use it. These equipments were provided by the suppliers originally for ensuring better operation and it now appears that they may perhaps not be required at all for operational purposes. However, the Committee would suggest that a special study be made of all such equipments and attachments lying idle in the Plant in order to determine their necessity or otherwise for plant operation. In case these are not required, attempts may be made for their better utilization either within Durgapur or elsewhere. The information regarding the equipments lying idle and the reasons therefor may also be made known to the C.E.D.B. so that in designing future steel plants unfavourable aspects of these equipments will be fully kept in view.

5.12. Durgapur Steel Plant was the last of the three plants of the HSL to commence production. Considering all the factors, its erection was speedy enough but it did not come into production as rapidly as a sister plant. However in judging its performance, at the earlier stages, the attendant circumstances have also to be considered. The Contract with ISCN had provided that the various sections of the Plant had to be taken over as soon as completed, their commissioning being the responsibility of the HSL. Very few experienced steel men were available in the country and therefore the overwhelming majority of men that could be got together were new and inexperienced. Competence develops slowly, specially in the lower rungs. In the circumstances, the HSL had to fall back upon many foreign personnel to give the plant a start. As was only to be expected, the best men could not be attracted in large numbers for the relatively short periods for which it was thought wise to recruit them. It is feared that some of the Indian counterparts of these foreigners did not learn from them with that eagerness and attention as was expected. The welding of such diverse elements into an efficient team has unfortunately taken much longer than was hoped for. All these factors along with the difficulties in getting proper supplies of raw materials in the early stages combined in the slower growth of production at Durgapur and in judging its performance due allowance must be given for the factors that were beyond the control of the management.

5.13. The reasons for unsatisfactory performance in certain departments at Durgapur can be traced to the inadequate observance of the various techniques and systems mentioned in Chapter IV and may be broadly divided under the following heads:

(i) Inadequacy of the Organisation.

(ii) Inadequacy or absence of management systems.

(iii) Inadequacy of equipments.

(iv) Skills and abilities of the employees.

(v) Employees attitudes and Industrial relations.

5.13: (i) *Inadequacy of Organisation*: The general pattern of organisation and manning for Durgapur was originally based upon the pattern prescribed by the Head Office of HSL but with the decentralisation of authority and passage of time concepts changed. The result is that although the organisational structure of the operating departments conforms more or less to the normal pattern existing in the steel industry that of maintenance and staff departments has not been placed on a very sound footing. There has been some duplication of effort also and the best use has not been made of some departments.

5.13: (ii) *Inadequacy or absence of management systems*: In the rush for increasing production, the management could not apparently devote attention to the importance of creating and establishing sound systems of management for the various functions. Of these, the important ones are the systems for production planning and control, preventive maintenance, communication and coordination at various levels, inspection and quality control, right type of incentive schemes, systems for promotion at non-executive levels, definition of channels of promotion etc. Since the Plant was not exposed fully to the systems prevailing in other Plants, owing primarily to the absence of a proper system for interplant pooling of knowledge and experience, the plant management apparently felt that their systems were set on correct lines.

5.13: (iii) *Inadequacy of equipments*: In the opinion of the management, the I.M.T. Plant was well designed and its layout was also adequate for the achievement of the rated capacity except in a few cases. The major deficiencies lay in the following units:

(a) The Coal Washery which could not handle the extra fines in the coal. This, however, did not affect production since washed coal to give the correct blend was generally supplied by the Washery to the extent required.

(b) The number of Soaking pits was inadequate and a few more pits would have helped the Blooming Mill perform with ease, on a continuous basis, to give its rated output.

(c) A few additions and replacements to the Plant, were, however, carried out in the various departments to make it possible for the Plant to perform to capacity.

The details are given below:—

	(Rs. in lakhs)
Coke Oven	4·55
Blast Furnace	8·38
Steel Melting Shop	11·52
Rolling Mills	20·56
CEM Department	4·55
General Services	46·63
Locomotive & Rolling Stock	10·99
Research & Control Laboratory	11·27
TOTAL	118·45

It will, however, be seen that the total additional investment forms a very small portion of the initial capital cost of the project and may be regarded as inevitable.

(d) Certain facilities have also been provided under the 1·6 MT expansion which will be very helpful. A list of such facilities is at Annexure V-C. Absence of these facilities has not, however, been deterimental to the working of the million tonne plant except in the case of the Coal Washery and the Soaking pits as explained earlier.

5.13.(iv) *Skills and abilities of employees*: With the very rapid growth in the requirement of personnel at all levels in the organisation and with a general expectation prevailing everywhere of earning promotions every two to three years, the pressures for promotions seem to have taken precedence over acquisition of requisite skill, ability, and knowledge required for establishing fitness for promotion to the higher posts. This resulted in some cases in men occupying higher posts before they actually matured for them. The Training Department was also not well organised to take up employee training schemes on a scale required to cope with the situation. However, this position has considerably improved now. The Committee is constrained to remark that the pressure being generated for quick promotions by individuals and groups is bound to affect the plant performance adversely. The management must resist such tendencies forthwith if the health of the plant has to be maintained.

5.13. (v) *Employee attitudes*: Durgapur like other Steel plants in the HSL started with a collection of personnel from several sources and it was but natural to expect that it would take time for the building up of traditions and team spirit. In the cadre of workers, apart from the slow building up of competences, indifference and indiscipline have been gradually increasing, which the recognised Union has not only been unable to curb but sometimes it has itself lent its support to such actions. The unrecognised unions take to such measures presumably to extract undue advantages and recognition. Almost every Superintendent of the Plant as also other Officers have mentioned in their replies to questionnaires that though they have not much to complain about the loyalty of the workers in their individual capacity, their collective discipline needs much improvement. The Committee also sensed-some lack of *esprit de corps* at all levels. Whatever be the reasons, the top management must exhibit the required leadership to bring about the much needed change in the attitudes of both the executives and the workers.

5.14. In conclusion it may be stressed that the Durgapur Plant has a long and arduous road to travel to come up to the category of good performers. Simultaneously with getting over their present ills, both short and long term measures will have to be undertaken and pushed through with skill and determination to make up the leeway and forge ahead to attain high levels of efficiency.

CHAPTER VI

COKE OVENS

6.01. The main units of the Coke Ovens complex of the Durgapur Steel Plant comprise of the Coal Handling Plant, the Coal Washery, the Coke Oven Batteries with the necessary services and the By-products Plant. The cost of the various units at the 1.0 Million tonne (1 MT) stage has been of the following order :—

1.	Coal Handling Plant .	. Rs. 3·05 Crores.
2.	Coal Washery . .	. Rs. 1·57 Crores.
3.	Coke Oven Batteries .	. Rs. 9·15 Crores.
4.	By-Products Plant .	. Rs. 9·86 Crores.
	TOTAL . . .	. Rs. 23·63 Crores.

6.02. At the 1 MT stage, the daily requirement of coal for the Plant is nearly 6,000 tonnes. This coal is received from three sources. The medium volatile (25-28%), Barakar Coal has a low ash content (15-18%) and is a good coking coal. The high volatile (33-36%) Dishergarh coal which also has a low ash (15-17%) content is a semi-coking coal. The low volatile (21-24%) Jharia coal which has a high ash content (20-25%) is a good coking coal, but its high ash content has to be reduced by washing it in the Plant Washery which brings the ash percentage down to about 17-18%. These three types of coals are blended approximately in the ratio of Jharia (washed) 45, Barakar 35 and Dishergarh 20 percent. The ash content of the blended coal varies between 17-19% and the volatile content varies between 26-28%.

6.03. On account of the dwindling reserves of high grade metallurgical coal, the washing of inferior grades of coal becomes necessary to reduce its ash content. The Coal Washery in Durgapur has a capacity for washing about 360 tonnes of coal per hour. The coal is washed in Drewboy Dense Media and the Feldspar Jig. The performance data on the Coal Washery is given in Annexure VI-A. It may be noted that the Washery works an extra shift every week on Sundays, which is not the usual practice with other washeries. Also because of better yield than expected, the washery has been, by and large, able to meet the required proportion of washed coal in the blend. However, due to excessive fines in the coal received and breakdowns which come to 8-10% of available time the working of the washery has been adversely affected. Additional equipments have been provided at 1·6 MT stage to enable the washery to attain its rated capacity in keeping with the quality of coal received. The coke ovens also will now throw a bigger demand on the washery and, therefore, it is essential that adequate attention is given to the maintenance of the Washery. During discussions the Plant management informed the Committee that no trouble in the operation of the washery is now expected. The Comittee would, however, suggest that by improving operating and maintenance practices, the Plant should examine if it is at all necessary to work the washery on Sundays, which will make more time available for maintenance.

6.04. The Coal Handling Plant consists of wagon tipplers for emptying wagons, Bradford Breakers for breaking coal and blending beds, the reclaiming and blending of the coal being done by Robins Messiter System. The system has not worked effectively in the past owing to improper operating practices and fluctuation in the type and quality of coal supplied. However, at the 3.4 MT stage provision will be made to crush the coals individually and store them in blending bins for accurate blending. After blending, 80% of the coal is crushed to below 1/8″ size and is then sent to the Coke Oven Battery Bunkers. Under normal conditions, the Coke Ovens need about 5,200 tonnes of blended coal per day.

6.05 The Coke Ovens at Durgapur consist of 3 batteries of 78 coke ovens each. The batteries are of underjet compound twinflue type fired by blast furnace gas, though they can be fired by Coke Oven gas also. Each oven is capable of taking 18 tonnes of blended and crushed coal. Loaded charging cars drop the required quantity of prepared coal into an empty oven through four charging holes. The coal charge having been levelled, the various gates and charging holes are closed and the oven is connected with the gas collecting main. As soon as the coal falls into the hot ovens, devolatilization begins until all the volatile matter has been expelled. Coking is completed in about 19½ hours time when the doors are removed and the coal is pushed out into the quenching car where it is quenched with water. It is then conveyed through conveyor belts to the grizzly where under-size coke (below 1½") is separated and the Blast Furnace size (+1½") goes to the Furnace storage bins. The quantity of different types of coke produced daily in three batteries when in continuous operation is 3,300 tonnes of blast furnace and nut coke, 500 tonnes of pearl and breeze coke are also produced but these cannot be used in the Blast Furnaces. The batteries also produce about two million c.ft. of gas per hour. The crude gas is passed through the By-Products Plant and after recovery of the various by-products, which are saleable products, the clean gas is delivered to the various departments for use as fuel.

6.06 The clean coke oven gas has a very high calorific value and is the most important source of fuel in the steel works. Mixed with blast furnace gas in suitable proportions and under the required pressure it is used in the soaking pits, the Rolling Mills and the Lime and Dolomite Calcining Plants. By itself it is used under high pressure in the steel melting shops in conjunction with other fuels like pitch creosote etc. for converting iron into steel.

6.07. Coming back to the Coke Ovens, Battery No. 1 was commissioned on 18th December, 1959 and taken over on 25th December, 1959, Battery No. 2 on 27th December, 1960 and taken over on 7th February, 1961 and Battery No. 3 was commissioned on 8th May, 1962 and taken over on 1st June, 1962. The performance data on Coke Ovens is shown in Annexure VI-B. The percentage of coke produced as compared to the capacity is, however, given below:—

Year	Wet basis	Dry basis
1963-64	109%	102%
1964-65	106%	100%
1965-66	101 %	95%
1966-67:		
I Qr.	81%	75%
II Qr..	62%	58%
III Qr.	62%	58%

6.08. The Coke Ovens were quicker in reaching the target production than other sections of the Steel Plant. However, the coke was not actually weighed but calculated on the basis of the number of ovens pushed multiplied by the standard production of each oven. In view of the fact that it was found later on that some of the ovens were under-charged and also that some "green pushing" of ovens *i.e.* pushing before coal has been fully coked, was resorted to, the actual production of good coke should be somewhat less. This is also borne out by the fact that 58,000 tonnes of coal were found surplus at the close of 1963-64 and 66,000 tonnes were surplus at the end of 1964-65. The actual reduction in the percentage achievement to be made on this account is neither possible nor would this exercise serve any useful purpose now. The quality of coke would also have been adversely affected by green pushing but the effect of this also is now indeterminate.

6.09. It was unfortunate that the management was lulled into the belief that everything was all right with the Coke Ovens because of the high production figures received from the Coke Oven Department. Actually there was a continuous deterioration in the condition of the ovens over a long period. Ample warnings had been received from time to time but did not receive the attention that they deserved. In April, 1961 the Chief Commissioning Engineer of the Simon Carves (India) Ltd. had pointed out that the conditions of operation and maintenance of battery No. 1, which had been taken over only on 25th December, 1959, *i.e.* less than 16 months back, had been rapidly deteriorating and that the conditions had become so bad that it would be classed as intolerable in any other modern coking plant. It was pointed out that 20 or more doors and frames were blazing merrily and the Oven-tops were thick with coal spillage which was in various stages of carbonisation. The oven chamber brick-work and facing brick-work had been completely neglected as also the iron-work. It was also stressed that the same remarks could be applied to battery No. 2, which had been commissioned and taken over on 7th February, 1961, *i.e.* only 2 months back. Particulars of the attention required were detailed in this letter and it was suggested that the establishment of a regular routine of maintenance, as indicated in the letter, should be adopted. The letter also contained a warning that unless positive action was taken immediately, disaster would soon overtake the Coke Ovens.

6.10. This was followed by a letter to the Superintendent Coke Ovens, on 10th July, 1961, wherein it was emphasised by the same gentleman that he could not agree that the position of leakage from the oven doors had been improved and that oven-tops were being kept clean as considerable quantity of coal were lying about there on both No. 1 and 2 batteries. In a letter to Mr. D. J. Bell, Resident Director, ISCON Ltd., the same gentleman reported for the period 1st November, 1961—15th November, 1961 that the working condition of oven-tops had further deteriorated. The doors had been neglected. There was considerable gassing on the tops making working conditions on the tops very bad. Leveller doors were also not cleaned.

6.11. It is not clear what action was taken during the next two to three years in improving the maintenance of the coke ovens. However, it can be surmisized that nothing substantial could have been done as would be clear from the letter of March 30, 1964 from Mr. S. R. Horner of the Simon-Carves India Ltd. to Mr. D. J. Bell, who had now become the General Manager of HSL, in which, *inter alia,* he had said that he had done a brief inspection of the ovens and felt most concerned about what he saw and that he was certain that unless prompt action was taken to improve the operating conditions, particularly on the coke side, considerable deterioration of the ovens was almost inevitable. Almost 20 ovens were blazing with consequent adverse effect on buckstays, door frames, tie rods etc. and ultimately must result in deterioration of brickwork also. In his opinion, it appeared that the vital task of oven operation and maintenance, requiring meticulous attention to details and relentless effort, had been considerably neglected in recent times. He indicated that Mr. Orme, an expert, could be sent to pay a visit and after detailed inspection, would be able to make his recommendations and suggested that the best action would be a joint discussion to plan the future course of action.

6.12. In his reply dated April 3, 1964, Mr. Bell noted the suggestions made and, while appreciating the visits of Simon-Carves people, did not accept the idea of any form of regular inspection by them. It was also mentioned in that letter that the fact remained that the Plant was running at the rated or above rated outputs in all the departments including the coke ovens and the management normally took in their stride the various crises which arose in this plant as in others and they would, of course, get out of the present difficulties in the Coke Ovens also. In spite of the Committee's endeavour to find out as to what action was taken after this reply, nothing positive could be obtained from the Office file.

6.13. Nevertheless, it is quite possible that better attention was paid. However, it would perhaps not be a wrong surmise that they were operated at full capacity without the major defects having been rectified or a system of effective maintenance having been undertaken. A real crisis broke out in February, 1966.

6.14. It will be of interest to note that Rourkela was also experiencing trouble with their Coke Oven batteries at about the same time and things seemed to come to a head by about the middle of 1964, when a Committee was set up consisting of the Technical Adviser, HSL and Shri S. N. Sinha Roy, Ex-Adviser Coke Ovens and By-products, Tata Iron & Steel Co. Ltd., to find out the causes and assess the degree of damage to the coke oven batteries and to suggest remedial measures for rehabilitation as well as to prevent such damages occurring in future. This Committee submitted an exhaustive report in October, 1964, which *inter alia* pointed out serious neglect of good housekeeping and preventive maintenance which had resulted in extensive damage and deterioration in the condition of the various parts of the Coke Ovens. They also pointed out lapses on the part of the staff and state of slack discipline in the Plant. Acting on this report immediate action was started and Rourkela managed to repair their Coke ovens within 1½ years' time at a cost of Rs. 25 lakhs and without causing any serious set back to the production in other departments.

6.15. The Rourkela situation has been quoted to emphasize the fact that Durgapur Coke Ovens had been in a similar condition, perhaps worse, at about that time and the Rourkela report could have applied to Durgapur almost without any amendment. With the walls the HSL Plants had built around themselves, Durgapur remained unaware of the happenings at Rourkela, but the fact still remains that Durgapur had been fully warned by experts about the bad state of their own plant.

6.16. The trouble in the Coke Oven Plant had thus been simmering for a long time but apart from inadequate action being taken now and then to patch up the defects, nothing substantial was done. However, the possibility of damage to Coke Oven Batteries was again brought to the knowledge of the present Management during the month of October, 1965 by Mr. Horner of M/s. Simon Carves during a discussion with the General Superintendent when he pointed out the damages and defects in the Batteries. A full report was then requested from him. This was received on 5th November, 1965 and was discussed by the top management but it is a matter of deep regret that even then, the seriousness of the situation was not realised and immediate action decided upon.

6.17. During February-March, 1966, due to trouble in the Plant there was a drastic fall in the production which remained low throughout this period and the labour situation was further aggravated in early April, 1966. It was only in the middle of May that a decision was taken to invite Mr. Sinha Roy, who had previously dealt with the Rourkela Ovens. He submitted his report on 24th May, 1966. Mr. Sinha Roy in his report had reiterated what Mr. Horner and others had previously mentioned that the condition of the Coke Oven was dangerously bad. He indicated that immediate action should be taken for repairs of the coke oven batteries and of the various items of machinery and equipment used there. A meeting was convened on 25th May, 1966 by the General Manager at which apart from the Plant Officers concerned, Mr. Sinha Roy and the representatives of M/s. Simon carves were present. M/s. Simon Carves were then asked to submit detailed reports and their quotations for repairs to the Plant. Plant Maintenance Organisation was also alerted and measures for better operation, day-to-day maintenance, and putting right the defective machineries and equipment were also spelt out. It was found that drawings were not available for the special refractories required and M/s. Simon Carves were requested to fly them out immediately.

6.18. After the above preliminary work had been undertaken, the plant authorities started the work in some earnest. Mr. Sinha Roy has been at Durgapur a number of times and is taking an active part in guiding the staff and the management in improving the conditions. M/s. Simon Carves have also set about their tasks, but in a satisfactory manner only from December, 1966. There has been the inevitable delay in getting the special refractories which have now started coming. However, inspite of the requests by the Committee, no proper schedules and programmes for the work have been received as apparently these have not been made out. The Consultant is also of the opinion that the Plant should set a faster pace for the repairs and the operation and maintenance staff should cooperate better in fulfilling this objective; otherwise the present targets which are indicated below would be difficult to fulfill:

No. of ovens to be pushed/day

Month		Existing batteries	4th battery	Total
May,	'67	180	40	220
June	'67	185	70	255
July	'67	190	70	260
Aug.	'67	190	90	280
Sept.	'67	200	90	290
Oct.	'67	210	90	300
Nov.	'67	225	90	315
Dec.	'67	240	90	330
Jan.	'67	255	90	345

6.19. The Committee feels that a better tempo must be built for the work and the pace of repairs accelerated in order that the target set before them could be realised. The Committee has also recommended to the General Manager that the departmental staff and the departmental gangs should be associated with the work of Simon Carves, especially in the field of Refractory repairs, so that the Plant personnel would be able to tackle such kinds of specialised jobs from time to time as necessity arises.

6.20. After a detailed examination of each battery and its constituents the quantum of work to be done by M/s. Simon Carves was checked by the plant management with the help of the Consultant. On the basis of their estimates, the Plant authorities feel that the total cost of the repairs would be of the order of Rs. 75 lakhs. To this must be added the cost of additional repairs that are necessary to the other equipments and machinery which is being done by the departments concerned but it will be difficult to assess its cost at this stage. A rough guess may, therefore, be made that the complete repairs would cost an amount between Rs. 9 to 10 million. It is anybody's guess as to what would have been the expenditure if through repairs had been undertaken earlier, say in 1964 or 1965 but on the example of Rourkela, it could perhaps be assumed that the Durgapur Coke Ovens might also have been fully repaired for about Rs. 25 lakhs.

6.21. It will be appropriate at this stage to look into the overall causes for the continued illness of the Coke Ovens at Durgapur and the delay in taking up the repairs. The desire to reach full production in the minimum time towards which objective the management was spurred by pressures all found led to the stepping of operation without giving any heed to the maintenance and other measures that were necessary to maintain the good health of the plant. The training of the staff received little attention, and even the duties of the executive and non-executive staff and the job descriptions of the operatives and workers had not been spelled out. It was conveniently believed that everyone knew his duties. Not only preventive maintenance, was badly neglected but even day-to-day maintenance, for example, cleaning of the doors, oven tops, the gas pipes etc. was not done. Many of the machines went out of order and were not attended to timely and work was carried on in a crude manner. Major repairs like changing of buck stays, oven doors etc. were not attended to at all. Wrong system of incentives, *i.e.* payment on the number of ovens pushed, had been introduced which led to the malpractice of undercharging and green pushing of ovens. In blending coal, the only concern seems to have been the watch on ash content, no attention being paid to the volatile contents of the blend or meticulously crushing the coal to proper size. This apparently led to a very large number of sticker ovens. A figure of 182 stickers has been reached by 6th February, 1967 which accounted for a loss of 1622 oven shifts but no warning was also taken from such an unusual occurance. In short, the staff immediately concerned with the management of the Coke Ovens failed to do their duty in so many vital spheres. It is also a matter of deep regret that inspections by higher management were obviously perfunctory because they failed to take heed of the state of the Coke Ovens at site, nor did they initiate any positive work for building up good operation or maintenance practices in this Department.

6.22. Since action was initiated, many of the ovens had to be kept out of production. During the worst phase, the number of ovens pushed/day was only 148 as against the normal No. at 288 and the production of coke and gas naturally dropped to the corresponding level. This resulted in restricting and reducing supplies of coke to the blast furnaces and gas supplies to the various units needing it. Naturally there was also fall in production in the By-Products Plant. To some extent only, the coke shortage was made up by buying coke at a much higher price from outside. The gas shortage was simiarly rectified to some extent by purchase of other costly fuels. Even then the production has fallen considerably in 1966-67 and it will continue to be affected for almost up to the end of 1967.

6.23. The Committee has been informed that the Durgapur Steel Plant will be suffering a loss of approximately Rs. 13·3 crores during 66-67, out of which it has been roughly estimated that Rs.5·75 crores will be consequent upon the difficulties experienced in the Coke Ovens. An amount of Rs. 25 lakhs will have been additionally spent during 1966-67 on their repairs. From the production plan made by the Plant to cover the period upto January, '68, it is found that only 1 milion tonne output will be achieved during 67-68 even though all the units at the 1·6 MT stage will have been commissioned by the first quarter of 67-68. Based on this plan the total losses during 67-68 have been estimated at Rs. 10 crores, of which about Rs. 3 crores may be attributed to the imbalances in the gas and coke production. A sum of Rs. 50 to 70 lakhs will also be spent on completing the repairs. Therefore, assuming that from 68-69 the repaired ovens will give their normal output the total consequential loss on account of the damage to the batteries incurred by the steel plant including the cost of repairs will come to about Rs. 10 crores.

6.24. Thus the Durgapur Steel Plant has received a great set back due to the neglect of all the categories of staff of the Coke Ovens and the service departments concerned and due to the gross neglect of the top management in failing to appreciate the seriousness of the situation in time.

6.25. In an integrated steel work the defective operation of any section, however small, can have a big adverse effect on the running of the whole plant. The Coke Ovens being the mother Plant have, however, a very vital role to play because not only do they supply the coke to the Blast Furnaces, which is next only to iron ore in importance, but they also supply Coke Oven gas for the steel melting shops, for soaking pits and for so many other heating furnaces. The Coke Oven gas is also the primary source for the recovery of by-products which if properly manufactured are a big source of revenue and high profits. The good health of the Coke Ovens is, therefore, of the highest importance and should be a matter of great concern to the Plant management. The exhaustive treatment of the present ills of the Coke Ovens made in this report and the measures already adopted for restoring them to normalcy contain an indication as to what should be done in future for their proper operation and maintenance.

6.26. In short the correct operation and maintenance practices must be properly understood by all concerned and acted upon. Good housekeeping and regulated preventive maintenance must be religiously demanded and enforced. The standard 3-shift system should be introduced without delay and even the recently modified incentive bonus scheme should be scientifically re-examined to see if it can be further improved upon.

6.27. It cannot be said what useful life the Coke Ovens have lost or if they will give their full capacity output but, given the correct attention henceforth, they should give good and trouble free service for a number of years.

6.28. The Committee would again like to emphasize that the malady in the Coke Ovens was a long standing one. In spite of ample warnings received from time to time, the first of which dates back to April 1961, and the sorry state of the Plant which should have been obvious to anyone dealing with it, whether he was engaged in the operation, the maintenance, or in the top managerial inspections, no one seems to have taken heed. There was gross neglect all round and failures of various degrees must be attributed to them. Whereas the operating and maintenance staff failed in their duties miserably, the negligence of the top management in position in Durgapur from 1961 onwards must also come for special mention. However, it is not for the Committee to indicate the degree of culpability or make a recommendation about the action to be taken.

6.29. The By-products Plant which in a way is an accessory of the Coke Ovens, has been dealt with in Chapter VII.

CHAPTER VII

BY-PRODUCTS PLANT

7.01. The products after carbonisation of coal in the Coke Oven batteries are Blast Furnace Coke, Nut Coke, Pearl Coke, Coke Breeze and the crude Coke Oven Gas. The 3 C.O. Batteries produce about 2 million cubic feet of gas per hour. It is collected through gas pipes and taken to the By-Products Plant. The Plant is of a modern design and is equipped with adequate facilities for the recovery of valuable By-products from the Coke Oven Gas which after stripping and cleaning is used as fuel in the different units of the Steel Plant. A flow sheet for the By-Products Plant is enclosed as Annexure VII-A.

7.02. The By-Products Plant in addition to several service units consists of the following main units:—

(i) The Tar Plant: The Tar Plant has a throughput capacity of 250 T/day but only 156 T/day of crade tar are available from the By-Products Plant and the remaining requirement was to be met from outside sources. The products of this plant are Creosote, Road Tars, Coal Tar and Naphthalene.

(ii) The Ammonium Sulphate Plant: The capacity of this plant is 57 tonnes/day.

(iii) The Benzol Rectification Plant: This plant is capable of treating 9,000 gallons/day (41 KL) of crude Benzol to produce Benzene, Toluene, Xylene and Solvent Naptha.

7.03. The various units of the By-Products Plant were commissioned in 1960-61, although the III coke oven battery was commissioned much later in May, 1962. The capital cost of the By-Product Plant was of the order of Rs. 9·86 crores. Several of these units are under expansion at the 1·6 MT stage and will undergo further expansion at the 3·4 MT stage.

7.04. The detailed performance of the By-Product Plant may be seen from the tables at Annexure VII-B. A summary is given below:—

Product	% of achievement on rated capacity during			
	1963-64	1964-65	1965-66	1966-67 (3 qrs.)
Crude Benzol	42·0	32·0	63·0	37·0
Benzene	42·0	30·7	56·8	32·2
Toluene	33·3	23·2	41·1	20·9
Xylene	5	3	6	3·55
Naptha	117·5	106·5	267·5	148·9
Crude Tar	99·3	89·1	93·8	58·4
Napthalene	65·1	74·8	73·1	42·5
Ammonium Sulphate Plant	71·0	85·0	74·0	43·7
Sulphuric Acid	62·0	73·0	67·0	52·3

7.05. It would be observed that the Tar Plant had worked more or less near its rated capacity till 1965-66 but the production has suffered a set back in 1966-67 due to shortage of gas consequent upon damage to the Coke Oven Batteries. The average performance of the Ammonium Sulphate Plant has only been about 70% till 1965-66. The performance of the Benzol Plant has been even less satisfactory, the maximum that was attained in 1965-66 was 63% of the rated capacity.

7.06. The yield of different products have correspondingly been low as compared to the expectations, as will be seen from the following table:

Product	Accepted yield %	Actual yield % achieved			
		63-64	64-65	65-66	66-67 (3qrs.)
	On coal charged (dry)				
Crude Tar	3·00	2·97	2·75	3·04	2·80
Crude Benzol	0·75	0·29	0·23	0·47	0·40
Ammonium Sulphate	1·00	0·80	1·00	0·90	0·80

Product	Accepted yield%	Actual yield % achieved			
		63-64	64-65	65-66	66-67 (3 qrs.)
Benzol Products	On crude Benzol.				
Benzene . .	70	63·8	62·4	60·1	57·5
Toluene . .	10	7·33	6·85	6·31	5·6
Xylene . . .	2	0·23	0·18	0·19	0·24
Solventa Naphtha .	1·6	4·07	4·94	6·45	6·46
Naphthalene . .	4% on crude tar processed	2·13	3·07	3·23	3·03

While the shortfalls in the achievement of the rated capacities may be due to several factors, the low yields are caused mainly by the deficient operation of the Plants.

7.07. The profits made/losses incurred by the By-Products Plant during the last few years have been given below:—

Unit of the By-Products Plant	Profit (+) Loss (—) in Rs. lakhs			
	63-64	64-65	65-66	66-67 (estimated)
1. *Tar Plant*				
DN Oil . .	+0·10	+0·12	..	
W.P. Creosote	+2·92	+2·67	+3·06	
Pitch . .	..	..	..	
Road Tar .	+0·13	..	..	
Napthalene .	—1·77	—3·68	—4·21	
Light Oil .	+4·38	+1·34	+0·83	
	+5·76	+0·45	—0·32	
2. *Benzol Plant*				
Benzene . .	—0·357	—30·48	—29·29	
Toluene . .	—0·043	—3·51	—3·11	
Xylene .	—0·002	—0·15	—0·14	
L. S. Naptha .	—0·019	—2·28	—3·31	
H. S. Naptha .	—0·006	—0·45	—0·34	
	—0·427	—36·87	—36·19	
3. *Sulphate Plant*				
Amm. Sulphate .	+1·78	+0·058	—10·68	
TOTAL . .	+7·13	—36·36	—47·21	—95·8

7.08. It is to be noted that the objects of establishing an elaborate By-Product Plant at DSP are:

(i) To remove the Tar and Ammonia from the C.O. Gas to make it clean, and

(ii) To enhance the profitability of the Plant by aiming at maximum possible recovery of the By-Products. It is, however, a matter for regret that instead of lending profitability to the Plant, the By-Products Plant has become a source of huge losses, which have risen still higher during 1966-67 owing to the abnormalities in the generation of C.O. Gas.

7.09. In case of the Benzol Plant, the recovery was presumably restricted during the earlier years owing to the paucity of orders but at present there is adequate demand for all Benzol products and is expected to rise further. The main factors affecting the cost of production are yields of products, efficiency of refining, recovery, and the losses. It has been stated that one of the main reasons which restricts the performance of the Benzol Plant, has been the difficulty in the removal of sludge from the oil coolers, which does not allow sufficient cooling of oil which prevents it from absorbing all benzol vapours. This can be traced back to the negligence in cleaning the sludge during initial years of running the Plant. It is, however, understood that an alternative design of rack coolers has been finalised by the Plant and is being fabricated in the Shops. It is hoped that with the provision of additional coolers the production and yield of Benzol may improve.

7.10. The production of Ammonium Sulphate depends upon the Ammonia content in the gas which is reported to be low. In order to maximise the yield of ammonia, it is suggested that the Plant management should have a special study conducted with the help of the Research and Control Laboratories and the Central Fuel Research Institute.

7.11. The performance of the Sulphate Acid Plant depends upon the availability of Sulphur, which is at present imported, and requirements of the Sulphate Plant. There is, however, a steady market for Sulphuric Acid and the economics of selling acid not needed by the Sulphate Plant should be considered by the Plant Management.

7.12. With the 4th C.O. Battery, of the 1·6 MT stage, no addition has been made to the Tar Plant as it has the necessary in-built capacity to deal with the enhanced availability of gas. Losses may, therefore, be minimised at the 1·6 MT stage.

7.13. However, the main reason for the shortfalls in the performance of the By-Products Plant, even when the generation of the C.O. Gas has been more or less normal, except during the current year, is the lack of proper maintenance and attention to the Plant. There are nearly 180 pumps in this Plant many of which are not working properly. For every pump there is a standby and only 90 pumps are supposed to be working at any one time. It is, however, understood that the spare pumps stand cannibalised in order to keep the pumps in position running. The By-Product Plant requires constant care in its maintenance, and it is essential to draw up a detailed and comprehensive programme of preventive maintenance for all pieces of equipment. It is, however, understood that a programme for repair pumps has now been drawn up and from January 1967, 9 pumps have already been repaired and put into commission. It is to be hoped that this drive will be maintained till all the pumps have been put back to use.

7.14. The partial recovery of by-products not only increases the loss to the plant but also causes the following difficulties:

(i) The gas mains are getting jammed with tar, naphthalene and resinous materials. As there is no provision for steaming the gas mains, a time will come when the mains will have to be cleaned manually.

(ii) The high speed boosters are getting jammed with tar and resinous materials frequently. For example, the ASP Boosters which have been on load only for six months have turned to such a bad shape that the Plant had to get a foreign expert to look to the difficulties, cleaning and overhauling of the Boosters.

(iii) Even the low pressure gas boosters and its fittings are getting frequently jammed with tar and resinous materials, causing difficulty to maintenance staff.

7.15. The poor performance of the By-Products Plant had also been commented upon by the Committee on Public Undertakings in their 29th Report on the working of Durgapur Steel Plant. The Committee had suggested an investigation into the causes of the low utilisation of these plants, but presumably because of the priority that has been given by the Management to the repairs to the Coke Ovens, no action seems to have been taken in this direction. The Committee is glad to note that the Head Office of HSL has taken in hand a detailed study on the working of the By-Products Plants in all the three steel plants and further action to improve their utilisation is in hand.

7.16. Considering the investment of about Rs. 10 crores that has already been made in the By-Products Plant at the 1 MT stage, and it is expected to rise substantially during the current and the future expansion programmes, the Committee feels that the By-Products plant should not be taken as an appendix of the Coke Oven Plant because the attention then invariably shifts to the batteries and to the supply of coke to the Blast Furnaces. In fact, experience shows that in almost all the situations where an activity does not fall into the main stream of production, it fails to receive adequate attention. The By-Products Plant is already treated as a separate cost and profit centre in the Steel Plant and, therefore, to ensure that it performs well, it is recommended that this plant be placed under the independent charge of a Superintendent reporting directly to the General Superintendent. More concerted effort is also required to maintain the Plant and operate it properly to convert the heavy losses into adequate profits.

CHAPTER VIII

BLAST FURNACE DEPARTMENT

8.01. The Durgapur Steel Plant for the 1 million tonne stage has three Blast Furnaces, each rated to produce 1250 tonnes per day. Together these 3 furnaces should produce 1·284 million tonnes of molten iron annually of which 0·30 mt. would be foundry grade and the balance utilised as hot metal for steel making. At full production, the plant at 1 m.t. stage requires approximately 6,500 tonnes of iron ore, 3,400 tonnes of coke, 1,200 tonnes of good quality limestone and 13,000 tonnes of air to produce 3,750 tonnes of iron per day. About 2,000 tonnes of slag, 200 tonnes of flue dust and 430 million cubic feet of Blast Furnace gas are made as by-products every day when all the three furnaces work at full capacity. The whole complex has cost Rs. 25·10 crores. The design and layout have been satisfactory and have given no cause for any complaint

8.02. The first Blast Furnace was commissioned on 26-12-1959; the second on 2-2-1961 and the third on 18-5-1962. After making 2·58 million tonnes of iron, No. 1 Blast Furnace was blown out on 9-9-1966. It has now been relined. Its two stoves are ready and the third one is expected to be ready by the first week of April, 1967 and, thereafter, this Blast Furnace would be ready for re-commissioning. The fourth Blast Furnace rated at 1,500 tonnes a day, which has been provided in the 1·6 M.T. expansion programme is now ready for commissioning. The Plant Authorities propose to commission it in May, 1967 and take down Furnace No. 2 in September, 1967 by which time it would have made 2·70 million tonnes of iron.

8.03. The performance data on the Blast Furnaces is given in Appendix VIII-A. The production of the Blast Furnaces from 1963-64 is reproduced below:

Year	Production 000 t.	Achievement on rated capacity.
1963-64	1,302	101
1964-65	1,313	102
1965-66	1,280	100
1966-67		
I Qr.	260	81
II Qr.	205	69
III Qr.	208	97

8.04. Consistent with the quality of raw materials and the coke available, the production of the Blast Furnaces has been quite satisfactory. The off-grade production has, however, varied. Upto February, 1966 the production was also upto the rated capacity as any shortfall in Coke from the Plant Coke Ovens was made good by purchases from outside. The fall in production from March, 1966 is due to the heavy shortage of coke caused by the troubles in the Coke Ovens which could not be fully supplemented by additional coke from outside. The Committee is satisfied that there should be no difficulty in the Blast Furnaces at Durgapur achieving their rated capacities as soon as sufficient coke becomes available.

8.05. Apart from the desired quality of iron ore and limestone, the coke quality should also be good and consistent. There has been a regular complaint at Durgapur that the quality of coke produced in the Coke Ovens has fluctuated widely. The difficulty in the Coke Ovens has already been dealt with earlier. Of late, however, the coke quality has been more consistent.

8.06. The coke rate per tonne of hot metal was 905 in 1963-64 and 878 in 1964-65 and 885 in 1965-66. But during 1966-67, it had deteriorated considerably to 950 in the first quarter. It has improved to 918 in the second quarter. With the recent improvement in coke quality, efforts must be made to bring the consumption down considerably. The Mehtab Committee has laid down a target of 750 Kg/tonne with Indian coke of 23-24% ash content. This should become possible of achievement when the additional facilities like use of sinter, top pressure, high blast temperature etc. are put to use and the required operating effort goes with them.

8.07. The silicon content of the hot metal has varied between 1·49% to 1·71%, though at times it has even gone up to over 2%. As high silicon content creates additional problems for the steel maker, a control at the Blast Furnace stage itself must be exercised to keep it within 1·35%, the target laid down by the Plant.

8.08. Owing to deterioration in the quality of iron ore, there has been considerable increase in the flue dust losses. Apart from reducing production, this has caused excessive load on the gas cleaning plant. Urgent action is indicated to control the quality and improve operation.

8.09. The cost per tonne of hot metal has also increased from Rs. 134 in 1963-64 to Rs. 174/- in the third quarter of 1966-67 and the output per man/year has also declined from 1493 tonnes in 1963-64 to 1219 in 1965-66. The cost of hot metal is directly affected by the cost of raw materials and the quality of coke which has been poor in the past. The output per man/year would also need looking into.

8.10. The mechanical maintenance of the Plant used to be under the control of the Superintendent but was later centralised in December, 1963 and placed under the then Assistant General Superintendent (M) which designation has now been changed to Chief Superintendent (Engineering Services). The Superintendent (Blast Furnace) was of the view that the centralisation of mechanical maintenance has not resulted in the improvement as was contemplated because effective control of shop maintenance at present rests at the level of Shift Foreman only as the General Foreman gets confined to office and to routine duties. The work involved, therefore, cannot be kept qualitatively and quantitatively at a high level as would have been the case if the Operation Superintendent was in-charge of such maintenance.

8.11. Certain equipments have been provided for increasing the efficiency of Blast Furnace operation. The details and the present position concerning them are given below:

8.11. (i) Top Pressure: Blast Furnaces No. 2 and No. 3 are provided with the facility of top pressure upto 0·7 atmosphere. Attempts have been made to run the two furnaces on high top pressure but had to be abandoned partly because the equipment was not working properly and partly because coke availability was poor to continue high rate of blowing necessary for high top pressure working. Durgapur has suffered from some coke shortage all along and this has grown acute during the last two years. The equipment itself is said to be not very sturdy and is subject to frequent breakdowns. The authorities think that the top pressure equipment and the electro flow regulator of the washers are not matching equipments. Efforts were made to rectify the defects through the suppliers who after some alterations made it work upto 0·5 atmosphere for some short period. The working under top pressure has never been satisfactory because of the frequent change of working regimes and the hunting of pressure in wide ranges. The cost of high top pressure equipment is about Rs. 5 lakhs. The Committee feels that this matter should be dealt with by a Committee of experts at HSL level and a firm decision taken about its use.

8.11. (ii) Equipment for oil injection was installed in No. 3 Blast Furnace and commissioned on 22nd October, 1966. The equipment was installed by M/s. Mechanical Services Private Limited, Calcutta at a cost of Rs. 7·5 lakhs. The later effort for installation of equipment for oil injection into No. 2 Furnace was purely indigenous and was done by the Plant personnel at a reduced cost of Rs. 3 lakhs. Oil injection at Durgapur Steel Plant gave satisfaction as the replacement ratio achieved was of the extent of 1·6 which is said to be the national average of most of the western countries. The operation of the furnace was also smooth. However for oil injection to be economical, the price of oil must be less than 1·6 times the price of coke. The cost of coke at Durgapur is around Rs. 85 per tonne while the oil costs Rs. 245/- per tonne. Oil injection in both the furnaces had, therefore, to be abandoned because of unfavourable price structure and the Government has been approached to waive the excise duty to make oil injection economical.

8.11. (iii) Humidity control: During 1·6 million expansion programme, facility for steam injection has been provided in all the four furnaces. None of these units have been commissioned yet. It is hoped to commission steam injection in No. 2 furnace during April, 1967. It may, however, be added that steam injection and oil injection are competitive practices and are not complementary to each other. In all probability, therefore, oil injection may have to be given up at Durgapur.

8.11. (iv) High Blast Temperature: The three furnaces provided during the 1 million tonne programme are designed to run on 800°C blast temperature. The new furnace No. 4 is, however, designed for 1050° blast temperature. With the steam injection now coming up during the 1·6 MT programme, provision has been made for increasing the blast temperature to 900°C in the existing furnaces. This is expected to give justifiable benefits. The extent of the benefit, however, can only be determined after No. 1 furnace is recommissioned.

8.11. v. **Sinter Plant:** A Plant of 5,000 tones per day capacity is being installed to provide about 50 per cent of sinter burden for the four furnaces. The Plant is nearing completion. Although originally it was to be ready by July, 1966, which date was changed to December, 1966 but it is now likely to be commissioned sometime during June, 1967. The Sinter Plant has been designed to work on the beneficiated fines from Bolani. In view of the fact that the U.S. AID Loan to Bolani has not materialised, the Sintering Plant may have to be commissioned, to begin with, on the unbeneficiated fines. The Plant authorities then except that the coke rate would further reduce to around 850 KG per tonne of hot metal. It is understood that HSL is taking over the Bolani Ore Mines as soon as the terms are finalised and immediate attention should also be given to the setting up of the required beneficiation plant at Bolani.

8.12. **Bleeding of blast furnace gas to atmosphere:** The estimated loss due to the bleeding of blast furnace gas to atmosphere is seen from the following table:

Years	Volume ^{3} 1000 MM	% of make	Estimated loss in Rupees—lakhs
1964-65 . . .	636847	18·5	47·3
1965-66 . . .	578526	15·5	47·2
1966-67 Upto Feb. '67 . -	307725	13·1	27·3

The Committee was informed that the loss due to bleeding of the blast furnace gas cannot be altogether eliminated because of practical limitations in using the entire gas in the steel plant owing to its lower calorific value. The Power House Boilers act as a buffer consumer for this gas but they too cannot absorb the entire quantity. The failure of the gas holder which went down in July, 1966 has added to the loss. The gas holder has had troubles in the past also and the premature failure of its tar seal has been stated to be due to bad workmanship during installation. The repair job has been undertaken under an expert who arrived in March, 1967. It is expected that the gas holder will be in the system from June, 1967. However, the Power House has been using lesser quantities of blast furnace gas *e.g.*, it used only 21 million Nm^3 in the month of December, 1966 against an average of 64 million Nm^8 during 1965-66. This should be looked into and efforts made to ensure that the loss due to bleeding is brought down to a level of 7 per cent or so.

8.13. Altogether the Blast Furnace is one of the Departments whose performance may be regarded as satisfactory. However, further attempts must be made to improve the quality of the hot metal, reduce consumption rates and increase the output per man/year.

CHAPTER IX

STEEL MELTING SHOP

9.01 The Steel Melting Shop at Durgapur consists of 8 Open Hearth Furnaces with requisite auxiliary facilities and equipments. 7 of these furnaces were of 200—tonne capacity and the 8th furnace meant for making Wheel Steel was of 100—tonne capacity. The cost of the entire shop with a total capacity of 1·016 million tonnes of ingot steel was Rs. 32·4 crores. The design and lay-out of the shop has been considered adequate for the duties involved.

9.02 The first Open Hearth Furnace was commissioned in May, 1960 and by September, '61 the remaining 7 bigger furnaces had been commissioned. The 100-tonne furnaces was, however, commissioned later in May 1962. At the 1·6 M.T. stage an additional Open Hearth Furnace of 220—tonne capacity had been provided. This furnace is ready but due to some labour troubles it has not been possible for plant authorities to commission it. The 200-tonne furnaces are also being enlarged to a capacity of 220-tonnes each and the 100-tonnes furnace is to be converted to a capacity of 120-tonnes. At the 3·4 million tonne stage, the steel is proposed to be made by the L.D. process. Therefore, no further additional open hearth furnaces are proposed to be installed.

9.03 The performance data on the Steel Melting Shop is given in Annexure IX-A. The production of ingot steel from year to year is as follows:

	Rollable Production ('000 tonnes)	Achievement on rated capacity. %
1963-64	972	96
1964-65	1006	99
1965-66	1001	99
1966-67—		
1st Quarter	196	77
2nd Quarter	162	64
3rd Quarter	181	71
4th Quarter	230	90

The performance, therefore, in terms of quantity of production in the Steel Melting Shop has been near the rated capacity till 1965-66. The production, however, fell substantially during 1966-67 owing to the shortage of Coke Oven gas, low calorific value of the gas, other faults in the furnace and also frequent labour troubles. With the use of fuel oil in the furnace, however, the production has improved to 90 per cent during the last quarter of 1966-67. The furnace availability which was quite high during earlier years has fallen to below 75 per cent during the three quarers of 1966-67.

9.04. In terms of quality, the Shop has achieved 89·9 per cent of tested quality steel and of the balance off-grade production has been about 9·4 per cent and scrap 0·7 per cent. The rejections have been mainly due to deviations in chemical analysis, cold heats and bad teeming. In case of the 100-tonne furnece, the Committee regrets to note that whereas the Rlys. are starving for supply of Wheel sets from Durgapur, only 71 per cent of the production from the 100-tonne furnace constituted Wheel heats during 1965, which figure fell to 62 per cent during 1966. However, the balance of heats contained those heats which were not attempted for wheel casts due to various reasons including shortage of fluted ingot moulds. Priority has to be given for making Wheel Steel and the various difficulty must be got over, keeping in mind also the very heavy rejections in the Wheel and Axle Plant out of whatever ingots are supplied by the Open Hearth Furnace. The Committee feels that it should be very much possible for the plant authorities to make atleast on an average rate two Wheel heats per day in this furnace enabling about 60,000 tonnes of ingots to be fed to the Wheel and Axle Plant/year.

9.05 The consumption of scrap has fluctuated in the past and during 65-66 it has been as low as 185 Kg. per tonne against a standard of 217 Kg. per tonne. In order to improve the economics of production, the percentage of scrap charged should be raised further and more pressure should be brought to bear upon M/s. Thomas Moughet, the scrap recovery contractors for supply of the required quantities of scrap. The heat input per tonne has been consistently high which may be due to various factors, namely quality of hot metal, ratio of desiliconised to the straight hot metal charge, amount of scrap used, and operational and maintenance delays. This factor can therefore be largely controlled by proper maintenance and vigilance in operating practices.

9.06. The tap to tap time of the 200-tonnes furnaces and the 100-tonnes furnace is on the high side and the operation staff must pay greater attention in reducing the tap to tap time and improving the production per hour per furnace which has also been low.

9.07. **Bunching of heats and production of off-heats:**

9.07. (i) A study of the heats tapped at different time intervals at the Steel Melting Shop during 1965-66 and 1966-67 (up to January, 1967) has revealed that the frequency of heats tapped at the end of a shift and the beginning of the next shift was almost twice as much as at other times of the day. The Committee accordingly got a study made of the heats tapped at the different hours of the day during 3 months, January, 1964, May, 1965 and October, 1966 selected at random. The result of analysis of the random sampling is given below:—

(*i*) Total number of heats tapped during 3 months	1301
(*ii*) Total number of off heats . . .	198
(*iii*) Total number of heats tapped at the shift ends	371
(*iv*) Total number of off-heats at the shift ends	71
Therefore, the percentage of off-heats .	15·2%
The percentage of heats tapped at shift ends	28·5%
The percentage of off-heats at shift ends. .	37%

9.07. (ii) The generation of off-heats to the extent of 15 per cent is considered very high and since only part of it may be diverted to an acceptable quality of product, it represents a definite financial loss to the Plant ultimately. The number of heats tapped at the end of shifts is 28·5 per cent as against a normal expectancy of about 14 per cent. This has two main implications, firstly it creates bottlenecks at the soaking pits necessitating diverting certain heats to cold stock and secondly the frequency of off-heats during the period of bunching is almost three times the normal expected figure of 14 per cent. Althrough it is agreed on all hands that bunching cannot be eliminated altogether, this study shows that this is something on which control can and must be exercised in order to get better output from the soaking pits and consequently from the mills and also to minimise the incidence of losses due to off-grades.

9.08. The Committee was not happy at the house keeping and cleanliness in the Plant. The original system of slag disposal was to carry the slag in pots on slag transfer carriages to the slag bank but this system was given up long ago. The Committee was informed that the original system was creating many bottlenecks in the production line and was given up after detailed discussions with Indian and Foreign experts. The disposal of slag at present is being done by poring the slag on the ground, cooling it and then removing it with the help of EIMCOs and dumpers. The rate of disposal of slag has been much lower than the rate of its accumulation with the result that the pit side is found to be generally unclean, which is stated to be due to insufficient number of dumpers. Two more EIMCOs are expected shortly and the position is expected to ease after that. Just below the flush holes, the area is full of large accumulations of slag but the Committee was informed that this was done intentionally to provide a sloping bed for the flush slag to run to the pit side. This, however, endangers the life of structures and columns and has choked the ventilation to the furnace brick work. It is essential, therefore, that the clearing of the muck and debris receives the attention of the higest authorities. It is suggested that the Industrial Engineering Deartment should be asked to look into the whole matter immediately and a proper method for effective disposal of slag may be adopted. The valve area was found to be in a deplorable condition with accumulations of muck and unwanted materials. A crude manual method was seen in use in the valve area to handle wet flue dust. This is mainly due to lack of maintenance of the ejector pums, soot blowers, etc. Due attention must be paid to house keeping in the area which should be freely accessible from all side.

9.09. One of the factors that has been emphasised by the Superintendent as standing in the way of improvement in the production is the sporadic supply of moulds both in regard to the quality and quantity. In this connection the Plant foundry working has to be geared up considerably. This matter has been dealt with separately in Chapter XII.

CHAPTER X

ROLLING MILLS

10.01 The three HSL Steel Plants were designed to roll distinct categories of finished products to meet the country's demand and the Durgapur Steel Plant was to specialise in the production of light and medium structurals and sleepers and wheel-sets for the railways.

10.02 The different units of the Durgapur Rolling Mills are the Soaking Pits, the Blooming Mills, the Billet Mill, the Medium Section Mill, the Continuous Merchant Mill, the Sleeper Plant and the Fish Plate Finishing Plant. At the 1-million tonne stage, the capacity of the mills for rolling finished and semi-finished steel products was of the order of 814,000 tonnes. The cost of Rolling Mill complex is Rs. 39·3 crores.

10.03 The Blooming Mill has the necessary in-built capacity to meet the 1·6 million tonne ingot steel production after the I phase expansion of Durgapur. Finishing equipments have been added to the Section Mill to take care of increased production and a Skelp Mill of 250,000 tonnes capacity has also been provided. The sleeper plant has been modified to produce both metre gauge and broad gauge sleepers. The capacity of the Merchant Mills remains unchanged. Provision has also been made to increase the quantity of blooms and billets for sale to 370,000 tonnes from 250,000 tonnes.

10.04 In this chapter the performance of all the sections of the Rolling Mills will be considered except the Sleeper Plant which will be dealt with in the Chapter on Wheel & Axle Plant.

10.5. **Soaking Pits:** For the 1-MT stage 10 soaking pits of bottom fired type with the holding capacity of 14 ingots of 7 tonnes had been provided. The Plant appeared to have had some difficulty with the maintenance of these pits. The Soaking Pits, therefore, proved somewhat of a bottleneck and it was with difficulty that the work was managed with this number during the past years. For the 1·6 MT stage, 6 more soaking pits of side-fired type, of a capacity of 120 tonnes each have been provided. Four of these have already been commissioned. For various reasons the Plant management asked for a total of 20 soaking pits, *i.e.,* 10 more of the newer type in addition to the 10 old pits for efficient working at Durgapur. It had been the contention of the Plant that due to the shortage of soaking pits, there is usually a large accumulation of the ingots waiting for soaking on the one hand and on the other the Blooming Mill which feeds all other rolling mills has not been able to receive adequate supply of hot ingots in a regular flow.

10.06 The matter regarding the adequate number of soaking pits required at Durgapur had been looked into by two Consultants and the CEDB and the question was finally referred to this Committee for advice. The Committee has already made a recommendation to the Government that 20 pits may be provided for Durgapur to provide for flexibility in the Plant operation and also for the reason that with the evolution of better techniques and adoption of better practices, the production of the Steel Melting shops may go beyond the targets at which time additional capacity will prove useful.

10.07. One of the main difficulties created at the Soaking Pits is by the bunching of heats in the S. M. S. (Steel Melting Shop). Inspite of the protestation from the Plant that bunching is unavoidable, the Committee believes that if proper studies are made by the Industrial Engineering Deptt. and strict measures are taken, the bunching can be reduced, specially the severe bunching that takes place at the end of the shifts. This matter has been considered in detail in Chapter IX. Suffice is to state at this stage that if bunching is reduced, there will be a regular flow of ingots to the soaking pits and a regular flow out of them with consequent economy in fuel consumption in soaking pits. Another dis-advantage of bunching, as it takes place, is the production of off-grade steel which will also be reduced.

10.08. The consumption of refractory bricks in the soaking pits is abnormally high as compared to the other plants. This is also borne out by the fact that repairs to the refractory brick work have to be done more often in the Durgapur soaking pits. During some of the visits to the soaking pits, the Committee found that the repairs of the pit covers and obtaining the required materials and spare parts for the same continue to cause difficulties to the Department. The position however, seems to have improved lately. There is also scope for improvement in respect of the heat consumption per tonne of steel in the soaking pits.

10.09. The flow chart at Annexure II indicates the flow of steel from Steel Melting Shop to the Primary Mills and to the other finishing Mills. The Blooming Mill was commissioned on 9th May, 1960 and is meant to convert the 7·8 tonne ingots into blooms, normally of 12" sq. size and also in small tonnages to 9" sq. as heavy forging blooms. The blooms after shearing proceed to the 32" Intermediate Mill or are transferred to the heavy bloom bay for despatch by wagons, as required. On receipt of the blooms from the 42" mill, the Intermediate Mill rolls them into various sizes upto 6" sq. for feeding them into the Continuous Billet Mills or the Section Mill. A part of the blooms is also sold as blooms or despatched to Axle Plant. The Blooms can be rolled to a minimum of 6" sq. Since the operation is continuous the average rated output of the Intermediate Mill is the same as that of the 42" Mill. The blooms or the slabs from the Blooming Mill proceed direct to the Continuous Billet Mill.

10.10. The Billet Mill was commissioned on June 17, 1960. It produces billets from 50 mm. to 125 mm. sq. as also Sleeper bars and slabs required for certain Merchant Mill Sections. The Billets again either go to the stock bay or for further processing in the Merchant Mill or are despatched for sale.

10.11. The Merchant Mill was commissioned on May 14, 1961 and has been designed for a maximum delivery speed of 2,000 feet per minute. It rolls rounds, squares, flats and angles.

10.12. The medium Section Mill receives blooms from the 32" Intermediate mill and after heating they are roughed and rolled in this mill, which was commissioned on 18th February, 1966. It rolls joists, channels, light rails, rounds, fish plates, bars and bearing plates of various sizes.

10.13. The performance data on the different mills is given in Annexure X and the data on the progress of production is reproduced below :—

Mill		63-64	64-65	65-66	66—67		
					I Qr.	II Qr.	III Qr.
Blooming Mill.	Prodn. (in '000 t.)	817	820	822	117	125	171
	% on rated capacity	95·1	95·5	95·8	81·9	57·9	79·2
Billet Mill.	Prodn. (in '000 t.)	528	514	496	117	85	108
	% on rated capacity.	98·3	95·7	92·4	87·4	63·0	80·0
Section Mill.	Prodn. (In '000 t.)	206	209	198	38	30	37
	% rated capacity.	101·5	102·9	97·4	75·4	59·8	73·5
Merchant Mill.	Prodn. in ('000 t.)	200	243	250	45	43	54
	% on rated capacity.	82	100	102	74	71	89

10.14. The Section Mill and the Merchant Mill sustained their rated capacity production till 1965-66. The performance of the Blooming Mill and also of the Billet Mill which has to depend on the Blooming Mill, has not been satisfactory.

10.15. The delays in the various mills have been shown in Annexure X. However the total delays and the mechanical delays are reproduced below :—

Mill	% delays.	63-64	64-65	65-66	66—67		
					I Qr.	II Qr.	III Qr.
Blooming Mill.	(*i*) Time lost to available time	NA.	46·5	46·7	51·6	59·1	52·8
	(*ii*) Mech. delays.	NA.	9·5	14·7	13·7	12·2	8·8

Mill	%delays.	63-64	64-65	65-66	66—67		
					I Qr.	II Qr.	III Qr.
Billet Mill . . .	(*i*) Time lost to available time. . .	NA.	64·3	67·1	67·3	72·5	69·6
	(*ii*) Mech. delays. .	NA	1·6	2·5	5·5	4·8	2·5
Section Mill . . .	(i) Time lost to available time . .	NA	33·8	37·2	42·8	40·3	38·5
	(*ii*) Mech. delays. .	NA	5·8	7·1	6·2	4·4	5·1
Merchant Mill . . .	(*i*) Time lost to available time. . .	NA	39·2	37·5	48·7	40·3	36·5
	(*ii*) Mech. delays. .	NA	5·7	4·5	6·3	5·2	4·3

The Committee feels that the delays in the various mills, leading to the loss of production, specially in the Blooming Mill have been very high and efforts should be made through proper production planning and effective maintenance to reduce the delays to a reasonable level of 20—25 per cent.

10.16. A high degree of coordination is naturally very necessary amongst all the units of rolling mills for the economical production of quality steel to the rated capacity. These mills also require the best of maintenance, proper supply of fuel and a smooth flow of semi-finished products for ensuring un-interrupted rolling into the required finished products. A good liaison must also be established all the time with the Steel Melting Shop for the timely receipt of hot ingots from the Soaking Pits. Quality Control, inspection, and testing of the products rolled are also of the highest importance. Similarly wagon supplies for movement of scrap, scales, semi-finished and finished products has to be ensured. For achieving optimum production, all the facets of the work involved here, therefore, have to be carried on in an efficient and delicately balanced manner.

10.17. The quality of production can be judged by the percentage of off-grades. These have been of the following order: (based on average of production for October, '66—Jan., '67).

Mill	% off-grade production
Blooming Mill	14·4
Billet Mill	18·2
Section Mill	26·0
Merchant Mill	24·5

The off-grade percentages are high and these must be reduced in order to improve saleability of the products and to increase sales realisations. It is essential to improve operating practices and to introduce more effective inspection at different stages.

10.18. The yields obtained at different Mills are quite satisfactory and the Committee is glad to note that the Plant management has been making persistent efforts to improve the prescribed yields further.

10.19. The labour productivity has shown a declining trend in all the mills except in case of the Merchant Mill. This aspect should be looked into and if excessive manning exists anywhere, advantage should be taken to rationalise the working force at the 1·6 MT stage.

10.20. Certain defects and shortcomings in these Mills have been pointed out by the Superintendents. The inadequate soaking pit capacity has already been stressed. It has also been stated that the last 4 stands of the Continuous Billet Mill are driven by a single motor as a result of which rolling of sleeper bars becomes difficult due to the fact that roll designer has very little freedom for pass design. The number of roll breakages during the rolling of sleeper bars is very high, which also results in stoppage of work. In the Section Mill at present there is no proper arrangement for dealing with the rejected blooms from the furnace for charging back into the furnace. A design has already been approved for overcoming this short-coming but work has not started. The Superintendent has also suggested that a reheating furnace may be installed, before the 32" mill, to take care of arisings of blooms and billets rolled in the Section Mill. This will also enable special quality steel billets to be rolled in the Billet Mill. This proposal is under consideration and the matter should be expedited. In the Merchant Mill, 4 repeaters have been provided but if there had been only two instead of 4, there would have been less rolling trouble. Very high cost would, however, now be involved in making this change and the best service has to be obtained out of the existing arrangement.

10.21. The Fish Plate Plant is capable of producing 11,000 tonnes of saleable fish plates for 50, 60, 70 and 90 lb. rails. It is also capable of making fish plates for heavy rails. The fish plate bars are rolled in the Section Mills. The bars are straightened and cut to size and then transferred to the drilling machines for making holes in each plate after which finishing touches are given.

10.22. The capacity of this Plant has not been fully utilised, so far, in the absence of orders from the Railways who in the beginning were importing billets and getting them processed into fish plates by the rerollers. However it has been decided that all future orders would be placed on the Durgapur Steel Plant. But the orders received so far are less than 25 per cent of the capacity of the plant with the result that the plant which is designed to work on three shifts is working on one shift only and even then the order is not big enough for continuous working of the Plant on one shift basis.

10.23. Rejections at the fish plate bar stage are of the order of 20—25 per cent. These are mainly due to metallurgical and rolling defects. Information regarding these defects is fed back to the concerned departments for taking steps for better quality control. The rejections on account of fish plate plant itself are of a very small order (1-2%).

CHAPTER XI

WHEEL & AXLE PLANT AND THE SLEEPER PLANT

11.01. The Wheel & Axle Plant at Durgapur is said to be the biggest and the most well-equipped unit of its kind in India. It was commissioned in January, 1962. This is a self-contained unit having forging, rolling, machining and assembly departments capable of giving an annual production of 45,000 finished wheel-sets weighing 57,000 tonnes, including axles of the 20 tonne roller bearing and 16 tonne plain bearing types, and a number of spare axles. Out of the finished wheel sets, about 30,000 sets have to be manufactured for broad-gauge and the balance for meter-gauge wagons. The weight of each wheel set for the broad-gauge is 1·37 tonnes and for the meter-gauge 0·63 tonnes and the axles by themselves weigh 0·41 and 0·16 tonnes respectively. The cost of the Wheel & Axle Plant is Rs. 12.27 crores.

11·02. The manufacture of 45,000 wheel sets annually requires 75,000 tonnes of wheel ingots and 23,500 tonnes of axle blooms. In the expansion programme for the 1·6 M.T. stage, provision has been made for 75,000 wheel sets which will require 39,100 tonnes of axle blooms. At present the special quality of steel required for the wheels is made in the 100—ton Open Hearth Furnace. After tapping, the steel is converted into fluted ingots by a bottom-pouring process which gives better surface to the ingots produced and eliminates defects like scabs due to heavy splashing of metal which arise in the ordinary top-pouring process. Each ingot is then nicked by an oxyacetylene torch and an ingot breaker breaks it into blocks (blanks) of suitable lengths for forging. The top portion of the ingot which is about 20 per cent of the total cannot be made use of in the Plant and has, therefore, to be rejected and remelted. In other plants this portion is usually converted into wheel tyres, but there is no such demand on the Durgapur Steelworks. The Wheel blanks are then heated in a rotary hearth furnace and forged in two stages, consisting of slabbing and finishing operations. In normal conditions, approximately 50 wheels could be turned out per hour when on full production. The central hole is now punched prior to rolling in the vertical Rolling Mill. Thereafter, the wheel is brought to the Dishing Press, where the wheel is coned. The wheels are then normalised by various processes.

11·03. The axles are manufactured in the Axle Shop out of the blooms received from the Intermediate Blooming Mill. The steel for these is made in the bigger Open Hearth Furnaces. After dividing the blooms into suitable lengths for forging, each bloom is forged into an axle by a 7-ton Compressed Air Hammer, with the help of a forging manipulator. The axle is then heat-treated in a furnace followed by oil quenching. The axles are then straightened and after the forging scales have been removed by shot blast, the axles are then swan to length and machined, centered and recessed. After some other operations, they are inspected. The finished wheels and axles of the proper size are then brought together and assembled and the required degree of machining done to complete the operation. Thereafter roller bearings are fitted as required and the wheel sets are finally passed and despatched.

11·04. The production of wheels and axles through the years has been as follows: (Detailed performance data at Annexures XI-A and XI-B).

Item	Unit	1963-64	1964-65	1965-66	1966-67 (3 Qrs.)
Finished Wheels	'000 T.	20	23	23	10
% achievement on rated capacity	..	50·0	57·5	57·5	33·3
Finished Axle	'000 T	12	12	11	6
% achievement on rated capacity.	..	70·0	70·0	64·7	47·1

11·05. It has already been mentioned above that the special wheel steel is produced in the 100-ton Open Hearth Furnace and on account of rigid specifications laid down there is considerable off-grade production. This comes to about 19 per cent on the average. Similar is the case with the axle steel, which is produced in one of the 200-ton Open Hearth Furnaces. Further, the ingots for wheel manufacture are cast in special moulds by bottom-pouring and although in other respects this process of special casting gives a superior quality of steel, it also accounts for high non-metallic inclusions from the indigenous refractory runner bricks. Extra machining is, therefore, necessary for the removal of these inclusions. In the case of axles, the machining allowance had to be increased because of the inexperience of the machinists, which also accounts for lower production on account of the additional time involved.

11.06. The Committee had an analysis made of the rejections in the Wheel & Axle Plant under various heads for the year 1965-66 and the nine months from April to December 1966-67 (Annexure XI. C). The results are tabulated below:—

	1965-66	1966-67 (Apr.-Dec.)
Wheels		
(*a*) Top	26·33	20·73
(*b*) Press Rejections :		
(*i*) Punching	2·31	2·21
(*ii*) Scrap at forging	2·42	5·01
(*c*) Scale	3·58	4·03
(*d*) Drop test	0·78	0·95
(*e*) Machining loss	8·79	7·61
(*f*) Rejection Met.	10·10	7·63
TOTAL	54·31	48·26
Actual yield on ingot	45·69	51·71
Project Report yield (1 M.T.)	50·00%	
CE & DB's 1·6 M.T. stage yield	50·75%	
Axles		
(*a*) Scraffing loss	1·00	1·00
(*b*) Scale	1·73	1·76
(*c*) End Cutting	5·55	5·66
(*d*) Machining loss	19·22	21·67
(*e*) Rejection at M/c stage	8·45	9·89
(*f*) Drop test	1·85	2·13
(*g*) Scrap at Forging	2·89	0·78
TOTAL	40·69	42·74
Yield on bloom	59·31	57.27
Project Report Yield (1 M.T.)	60·00%	
CE & DB's 1·6 M.T. stage yield	66·00%	

11·07. In the case of wheels, the hot-top loss, as has already been mentioned, is unavoidable. There is certainly scope for improvements, small or big, in other items. Metallurgical rejections have been reduced from 10·10 per cent in 1965-66 to about 7·63 per cent in the current year. These should be capable of further reduction by better quality control at different points. The machining losses are still on the high side and should be considerably low in this modern plant. Even though in the Project Report for Durgapur, the expected over all yield had been given as 50 per cent and even the CE & DB at 1·6 M.T., had taken a final yield of 50·75 per cent only, it appears reasonable that the Durgapur Steel Plant should eventually aim at a net yield of about 60 per cent. Similarly with regard to axles, the yield should not be less than 66 per cent as envisaged by the CE & DB at 1;6 M.T. stage. It has to be admitted that some of the shortcomings, for example inclusions due to the quality of runner bricks and the hot top lesses are beyond the control of the Plant management. But the off-grade production in the S.M.S. itself should be capable of greater control and reduction so that more ingots are made available to this section of the Plant and the production of wheel sets thereby stepped up.

11·08. To make the additional steel required for 1·6 M.T. stage, a 40-ton Electric Furnace will be provided for which tenders have been received and are under scrutiny. It will take about two years to install this furnace from the date of placement of order. The off-grade production from this furnace should be negligible. The capacity of existing 100-ton Open Hearth Furnace is also proposed to be increased to 120 tonnes. This and the Electric Furnace taken together should give all the steel required for the 1·6 M.T. stage when 75,000 wheel sets will be produced. Two more wheel rectification lathes and one axle roughing lathe and one centreless grinding machine have been ordered. The present difficulties of machining wheels and axles separately and the extra time and labour involved in matching them in a set will be avoided with the installation of the above tools. Rejections will also correspondingly go down. At present, there is only one rectification lathe and can deal with only a part of the production.

11·09. Coming to the axles, there is a great scope for a reduction in the machining losses which should come down to a reasonable figure of 15-17 per cent. There is a scope for some reduction in the other losses also. With better machining the out-turn should also increase. The yield of blooms, therefore, should not be less than 66 per cent, which should be obtainable if all-round effort is made to improve the operational efficiency of the various operations in the Axle Plant.

11·10. The Committee has had various discussions with the Plant management and the concerned officers in the Railways, both in the R.D.S.O. and the Railway Board. In fact, discussions were held with railway officers individually by the Committee at Lucknow and at Delhi including the Director-General, the Members and even with the Chairman of the Railway Board. The main concern of the Railways is the low availability at Durgapur of the wheel sets required by the Railways, with the result that they have to go in for large imports, all or much of which could be avoided if Durgapur could step up its production and supplies.

11·11. The Committee brought together Railway Officers and those of the Durgapur Steel Plant to discuss the various difficulties Durgapur Steel Plant is having in meeting the demands of the Railways and also to look into the question as to how heavy rejections in the Wheel & Axle and the Sleeper Plants could be reduced. In this meeting, the General Manager, Durgapur Steel Plant, said that great difficulty was being experienced in keeping a very close control on chemical composition because the railway specifications prescribed two limits, one within the tensile strength range of 49—55 tonnes per sq. inch tnd a second range of 55—60 tonnes per sq. inch. He suggested that the Railways should agree to a tensile strength of 45—60 instead of two groups mentioned above. The Railway representatives explained that the use in the same axle of two steels of widely different tensile strengths and consequent hardness was objectionable from the point of view of railwear. It was finally agreed that the status quo should continue as there were many difficulties in changing it and that the question of further relaxation could be reviewed from year to year after Durgapur had gained experience with the special electric furnace that they were proposing to install. The next question raised was regarding the elimination of microscopic examination of axles, as this causes delays. The Railway Officials explained that the main objective was to eliminate banded structure. Axles fail primarily due to fatigue and the static tests alone do not give all the assurance needed regarding their fatigue and dynamic behaviour. The Railway representatives said that oil quenching should be used as standard practice. On that the Durgapur Steel Plant pointed out that machining allowance has had to be increased due to oil quenching and straightening after quenching was also difficult. It was agreed that further joint tests would be conducted and the matter would be discussed in due course. Meanwhile status quo would remain.

11·12. The next point was regarding wheels and axles with smaller diameters. It was eventually agreed that a mutually agreed basis should be worked out on the service life available in each set. The Committee understand that this matter has been finalised and agreed to.

11·13. The difficulties met by the Durgapur Steel Plant on account of delays in the inspection and the consequent piling up of wheel sets blocking up the assembly lines and the area was explained and it was agreed that inspection will be more rapidly undertaken and that very soon there should be no difficulty on this account.

11·14. The General Manager brought up the point that in plain bearing sets, the railways had prescribed 127 mm journal diameter and no relaxation say upto 124 mm had been given. It was agreed that relaxation upto 124 mm may be given but the price would have to be negotiated on life basis, as for the wheel sets, as in para 11·12. As regards the delay in the supplies of fittings for 128 mm journal diameter sets, the Railway representatives pointed out that in this case Railways had agreed to help the Durgapur Steel Plant on a special request from them because it was really for Durgapur to arrange for axle boxes themselves. However, the Railways would consider the matter and give all assistance. At the request of the Committee, the Railway Board recently sent a special team to re-examine the wheel sets which had been previously rejected. On reconsideration, a good proportion of these has now been accepted.

11·15. The Committee is happy that it was instrumental in bringing together the representatives of the two organisations and in their coming to the best possible solutions. The Committee, however, would like to point out that it is high time that Durgapur Steel Plant made an all out effort to manufacture wheels and axles to the rigid requirements of the specifications and gradually do away with the unusual relaxations that have been given by the Railways. In this connection, the Durgapur Steel Plant authorities feel that as soon as the additional equipment viz., two wheel rectification lathes, one axle roughing lathe and one centreless grinding machine are installed and the electric furnace for steel making is commissioned, the correct type of steel would be available in required quantities and the delays in matching wheels and rectification of wheel sets for other defects would be eliminated, rejections would be reduced and total production stepped up to the required level.

11·16. The Assistant Superintendent incharge of the Wheel & Axle Plant brought to the notice of the Committee certain difficulties of the Plant. These were that in the beginning very few skilled workers were available and therefore, many of the unskilled workers who had got no experience had to be hurriedly trained and later on promoted to higher grades though they were not quite experienced. These people have been very slow in picking up competence. He also suggested the provision of one additional 5 tonne E.O.T. Crane in addition to the other machinery already on order. This request appears to be justified and an early decision is called for. It also came out in discussions with him that a system of rigid inspection should be introduced at various stages, for example, of blooms and blocks, in the forging of wheels and axles and different other stages of operation in the Wheel and Axle Plant itself and also in the machine shops and finally in the assembly of wheel sets and thereby the rejections would be considerably reduced.

11·17. The Industrial Engineering Department of the Plant had made investigations into the working of the Wheel and Axle Shops and found that the average percentage utilisation of machines in the Wheel Machine Shops was only 55·4 per cent. The non-productive time of 44·6 per cent was due to operator not being on the job, refreshment—break, absenteeism, waiting for materials, breakdowns, shift change and tools not available. In the Axle Machine Shop, the average utilisation of the roughing lathe, turning and finishing machines was 80 per cent. The non-working time of 20 per cent was due to approximately the same reasons as mentioned above. In the assembly shop, the press was working only for 55 per cent of the time. All the machines in these shops have, however, at sometime or the other achieved high production levels and the performance could, therefore, be considerably improved. The bonus earnings of the employees of the Wheel and Axle Plant depended on the production of the Steel Melting Shop but from June, 1966, this is being given on assembled wheel sets. Bonus earnings are not, however, directly linked with the individual group performance of the workers. A detailed study is called for to correct the defects in the present scheme.

11·18. The Committee would recommend that the plant be examined by a team of foreign and Indian experts well-versed in steel making for wheels and axles and the other processes involved, to get their guidance. It will also be advantageous thereafter to send two senior officers abroad to visit corresponding plants to make an on-the-spot study of their techniques. The Committee was given to understand that the Plant Management had requested for the services of several foreign personnel to run the various sections of the Plant. Such a step may not be necessary in view of the recommendation made above.

11·19. The Committee would also suggest that interstage inspection by the Research & Control Dept. should be strengthened and also a proper system of production planning for this plant should be instituted at an early date. Efforts should also be made to sort out the old stocks of wheels and axles which are to be rejected finally and the shop cleared of un-wanted accumulations.

11·20. The Committee is concerned at the further fall in production during the year 1966-67. This has been an abnormal year at Durgapur and in addition the wheel and axle plant has had its own difficulties in go-slow activities. There is no Superintendent in the Plant and the authorities are on the look out for a competent person. The Committee would urge that the expert examination be conducted immediately, the various other suggestions made above be enforced without delay, and the additional equipment procured early.

The Sleeper Plant

11.21. The Sleeper Plant at Durgapur which was commissioned in September, 1960, was designed to produce 60,000 tonnes of Broad Gauge Steel sleepers annually operating on two shifts basis. In the first stage of expansion, equipment is being provided to produce Metre Gauge sleepers also in this Plant. With a programme to produce both broad and metre gauge sleepers at the plant, based on three shifts operation, production will be about 75,000 tonnes per year after completing the modifications at the 1·6 M.T. stage. The production can be stepped up to 85,000 tonnes easily. At present the Plant has hardly sufficient orders from the Railways even for two shift working. The performance data on Sleeper Plant may be seen at Annexure XI-D.

11.22. Sleeper bars are rolled in the Continuous Billet Mill. These are the raw materials for sleepers. These bars, each 28 ft. in length, are transported from the Billet Mill to the Sleeper Plant by Railway wagons. An electrically driven shear cuts the bars into the required size on the Roll Table from where the cut sleeper bars are lifted to a furnace which has a continuous output of 15 tonnes per hour. Each bar for a broad gauge sleeper weighs 171 lbs.

11.23. After being heated in the furnace, bars are discharged on the walking bins on the skids and each bar in turn is placed against the female sleeper forming die with the help of levers. The Press Table is pushed up against the male forming die and the bar is hereby shaped into a sleeper. Immediately thereafter, by another movement, four holes are punched in the sleeper. The sleeper is then taken out from the female die and placed on the de-scaling conveyer and the scales are removed with wire brushes. While the sleepers are moving in the conveyer, they pass through a jet of water which washes the scales and lowers the temperature and then the sleepers are dipped in tar. They are then transferred to the cooling and inspection conveyer and finally stacked with the help of a pnuematic hoist. The sleepers are inspected according to the Indian Railway Standard Specification.

11.24. The manuacture of sleepers is quite a profitable item for the Steel Plant provided of course that rejections are kept to the minimum. Although considerable improvement is said to have been achieved in the quality of the steel of the sleepers, the rejections at present still stand approximately at about 12 per cent. Rejections in sleepers are mainly due to :—

(i) Metallurgical defects;

(ii) Rolling defects; and

(iii) Pressing defects.

Some steps are being taken to eliminate defects by the feeding back of information by the Sleeper Plant regarding metallurgical and rolling defects to the units concerned for taking necessary steps for better quality control. The Committee, however, feels that these call for more strict action and the rejection on these two accounts should be capable of being further reduced. However, the heaviest rejections are due to the third category of defects.

11.25. The Committee had an examination made of the rejections of Sleepers and it was found that during 1964-65 and 1965-66 and from April '66 to January '67, 22,01,440 sleepers were placed for inspection. Of these, 19,39,813 sleepers were passed and 2,61,813 sleepers were rejected, the percentage of rejection coming to 11·88 per cent. Of this, 10·06 per cent were rejected due to operation defects like twist, bad section, short spacing, holes out and wrong tilt. Bad rolling was responsible for 0·32 per cent rejection and 1·50 per cent of sleepers were rejected due to metallurgical defects. Technical studies revealed that the defects under tilt, holes out and short spacing are more or less interdependent and the most important factor governing such defects is temperature and other associated variables, over which meticulous control was said to be difficult. It is the opinion of the Plant that it is extremely difficult to maintain the tilt as well as the distance between the holes within the specified tolerances since pressing and punching are done almost simultaneously.

11.26. The Committee therefore went into the question of the rejections in the Sleepers due to punching defects in great detail. It was stated that these defects arise due to the almost simultaneous pressing and punching that is done at Durgapur Steel Plant. This matter also came up for discussion at the joint meeting of the Railway Officers and Durgapur Steel Plant Officers convened by the Committee. The Durgapur Steel Plant representatives explained the process of sleeper making and stated that the main rejections were due to spacing and tilt, and emphasised the fact that there were several variables in the production of sleepers on a mass scale and, therefore, the Railways should prescribe realistic specifications for sleepers taking into account technological limitations. The Plant representatives also thought that the standard of inspection was more rigid than it need be. It was said that the only way of reducing heavy rejections would be to drill holes after the bars had cooled rather than punch them at the hot stage immediately after the pressing. This should not only mean additional equipments but also a radical change in the lay-out and would of course be very costly.

11.27. The Director General, R.D.S.O. (Railways) stated that it should be appreciated that the safety of the track was of vital importance specially when the Railways were raising speeds and gauge had to be maintained much more correctly now and therefore, it would be difficult to consider any relaxation in the specifications without gaining experience about the behaviour of sleepers with bigger tolerances. It was then agreed that a joint study should be made of the behaviour of track with additional tolerances in tilt proposed at Durgapur to decide the extent to which further relaxation could be agreed to. The Committee now understands that the Railways are prepared to study the behaviour of sleepers on a track to be laid by them on sleepers with extra tolerances but have requested the Durgapur Steel Plant to supply the sleepers on loan for this test. The Steel Plant is considering this request.

11.28. The Committee feels that this request is reasonable, as if under running conditions it is found that the tilt with extra tolerance correct itself and the gauge is improved thereby, much of the difficulty experienced by the Durgapur Steel Plant in respect of rejections on this account would be overcome.

11.29. Altogether it is the view of the Committee that the rejections arising out of pressing and punching could be greatly minimised by proper checks during operation, proper maintenance of the plant and especially the dies, punching rods and presses and by improving the production techniques. Finally, the incentive bonus scheme is also responsible to a certain extent because it is linked up with the total production. If it could be based on the production of first class sleepers only, the operations would be more carefully undertaken at all levels. Considering all these factors, the Committee is of the view that if the maintenance is improved at all points, proper operation techniques are used and the bonus scheme is revised, the rejections should not exceed 5 per cent in this plant, especially with the relaxations that the Railways have given. This is the percentage to the achievement of which the whole machinery of the plant should be geared.

CHAPTER XII

THE CEM SHOPS AND THE FOUNDRY

12.01. CEM Shops: The Central Engineering and Maintenance Shops have been provided at Durgapur to enable routine repairs and manufacture of normal items for replacements to be carried out within the Plant. It was, however, stipulated that the replacements of major items of Plant would have to be procured from outside sources. Three major shops viz., Machine Shop, Structural Shop and Forge Shop along with others form the CEM Shops which were put up at a cost of Rs. 4·2 Crores. These have been further expanded at the 1·6 MT stage.

12.02. The performance data on the Shops may be seen in Annexure XII-A and the figures of production are given below :—

(In tonnes)

	1963-64	1964-65	1965-66	1966-67 3 Quarters
Machine Shop .	2,972	3,346	4,076	2,458
Structural Shop .	1,735	1,644	1,861	1,353
Forge Shop . .	345	392	455	336

It was indicated in the Project Report that the Machine Shop and the Structural Shop would have a capacity of 1000 tonnes each per year but the capacities which were later adopted by the Plant management for the purpose of comparing the performance were 2040 tonnes per year for the Machine Shop and 2040 tonnes for Structural Shop. It may be observed that the CEM Shops are in the nature of jobbing Shops and many times jobs mounted on the machine tools have to be dismantled to accommodate breakdown jobs. Frequent changing of jobs from the Machines tools affects their performance substantially. This happens, however, in almost all the jobbing shops but the frequency of such disturbances would depend partly on how well the Plant maintenance functions are organised and systemised and also the system of production planning in the shop itself. Therefore, because of a large variety of jobs handled by these shops, it would not be correct to judge their performance on the basis of tonnage alone as this does not reflect the true quantum of the contribution made at the shops.

12.03. The value of jobs executed by the CEM shops has varied between Rs. 118 lakhs to Rs. 162 lakhs during the last four years. However, an idea about the extent of orders which were offloaded and could have been done by the CEM Shops (including Foundry) may be had from the following figures covering the period 1963—1966 :—

(i) Total No. of work orders placed on CEM shops and Foundry	1076 Nos.
(ii) Total No. of orders offloaded but could have been done made in Shops & Foundry . .	625 Nos.
(iii) Approximate value of orders loaded during 4 years 1963-66	Rs. 140 lakhs.

Roughly therefore Rs. 35 lakhs worth of Shop Spares could have been manufactured in the Shops every year, which forms 23 per cent of the value produced in them.

12.04. The Committee visited the shops and discussed its working with the Chief Superintendent (E.S.) and the Chief Mechanical Engineer. The Committee agreed with the CME that vast improvements can be made in the output of the shops by proper balancing machines and tools which would mean the purchase of some additional tools, some changes in the lay-out of the shops and of the road approaches.

12.05. It may, however, be observed that some studies recently made in the Machine Shop indicate that the machine utilisation was around 25 per cent, and labour utilisation about 32 per cent. Based upon another random sample, it was found that idleness of a few machines varied between 12 per cent to as high as 88 per cent. It is, therefore, necessary for time studies to be conducted in all the shops in order to develop elemental standards for various operations for determining the standard times for different jobs. It is by a comparison between the standard time required for doing a job and the actual time taken that the true state of utilisation of an equipment, section or a shop as a whole can be determined. The determination of the standards will enable the shop supervisors not only to plan and control the performance of men and machines but will also enable the institution of a sound system for payment of incentive bonuses to the individuals/groups based upon their own performance rather than on the basis of the production of the entire plant. It is, understood that HSL have taken a decision in principle for making detailed studies of the shops in all the Plants in order to introduce a rational system of payment of bonuses.

12.06. Further, the utilisation of the Shops is also reduced by the break-downs of machines themselves, as also the time taken by the workers to meet their personal needs. The Committee would, therefore, recommend the following :—

(i) Time studies should be made to determine standard times for different jobs.

(ii) A study be made to see if the system of production planning and control for the shops is adequate and effective and if not it should be streamlined.

(iii) What balancing tools and additional staff are needed to improve production so that the maximum possible load of making spares be taken on by the shops.

12.07 **Foundry.**—The Foundry at Durgapur was put up at a cost of Rs. 3·4 crores. It is considered to be one of the best Foundries in the country and has been further expanded at the 1·6 M.T. stage. The four main sections of the Foundry are for making ingot moulds, general iron castings, steel castings and non-ferrous castings.

12.08. The performance of the various sections of the foundry will be seen from Annexure XII-B, which are summarised in the following table (figures in brackets indicate performance over rated capacity).

Item	1963-64	1964-65	1965-66	1966-67 (3 qtrs.)
i. Ingot Moulds and bottom plates	31,408 (155%)	31,227 (154%)	32,429 (160%)	16,982 (113%)
ii. Miscellaneous casting	1,370 (27%)	1,569 (30·1%)	1,920 (38%)	1,151 (31%)
iii. Steel Casting	607 (12%)	682 (14%)	939 (19%)	446 (12%)
iv. Non-ferrous casting.	95 (32%)	131 (44%)	132 (44%)	62 (28%)

It will be seen from the above that the performance of the ingot moulds foundry has been much above the rated capacity but the performance has shown a downward trend during the current year for which there seems to be no justification except for the fall in the 3rd Quarter of 1966-67 when the entire Plant was affected because of the August disturbances. The performance of the other sections of the Foundry has been very unsatisfactory being in the range of 12 per cent to 19 per cent for steel casting, 28 per cent to 44 per cent for non-ferrous casting and 27 per cent to 38 per cent for miscellaneous castings. The question arises as to why if the performance is beyond 100 per cent in the ingot mould foundry, the Foundry has not been able to meet the requirements of the Steel Melting Shop and why the performance is so low in the other sections. Here again as in the case of CEM shops it will be difficult to judge the performance of the various sections on the basis of tonnage except for the ingot mould foundry where the job is of a repetitive nature.

12.09 (i) In case of Ingot Mould Foundry, however, there are the following factors which tend to show inflated performance :—

(i) The production capacity of the Foundry according to the Project Report is 20,320 tonnes of ingot moulds per year whereas production of both ingot moulds and bottom plates are being clubbed together.

(ii) Gross production by the Foundry is being reported and not the production finally passed after inspection as being fit for use in the Steel Melting Shop. If allowance is made for the above in the production figures, the performance of the Ingot Mould Foundry would be substantially reduced.

12.09. (ii) The rejection percentage of ingot moulds and bottom plates which was about 11 per cent in 1965-66 has gone up to 17 per cent in 1966-67. Generally ingot moulds have been supplied by the Durgapur Foundry to the Steel Melting Shop, but there have been occasions when ingot moulds have been purchased from outside. In fact, the purchases made in the first nine months of 1966-67 were much higher at Rs. 6·2 lakhs as compared to Rs. 1·3 lakhs in 1964-65. This indicates that in addition to shortfalls in the production of ingot moulds and lower productivity during 1966-67, presumably the consumption of ingot moulds has also gone up and the quality has deteriorated.

12.10. The rejections of general iron castings stand at 16·7 per cent and those of steel casting are about 18 per cent. When compared with the normal figure for rejection which should be 5 per cent, these rejections are high and the trend is also not healthy as it shows further deterioration in the percentage of rejections, which must be arrested before long.

12.11. During the visit to the Foundry, the Committee found that various sections of the Foundry lacked order and men were found idle at many places. The Committee found heaps of scrap lying within the shop and a lot of castings waiting for cleaning. The Committee was informed that the management is aware of the inefficiency obtaining in the Foundry. Several reasons were advanced for this state of affairs including loss of production due to the breakdown of equipment, inadequate floor space, lack of orders for machine moulding, shortage of materials and inefficient working of the equipment. The main bottleneck which stands in the way of obtaining the required performance in the foundry is stated to be the lack of leadership and morale amongst the staff of the Foundry.

12.12. The Expansion of the Foundry at 1·6 m.t. stage has already been completed and the men are mostly in position. Therefore, in view of the additional availability it is difficult to appreciate the lower trend in the production and the quality of the foundry products. The Committee feels that besides the maintenance of equipment which might need improvement, the problems in the Foundry are (i) the lack of knowledge which has not been developed in the last few years, although in Durgapur itself there are quite a few Foundry Experts, and (ii) the leadership available to workers, which appears to be sadly lacking. The management should investigate the reasons for lack of morale specially at the supervisory level.

12.13. During the year 1966, 853 orders were placed in India and 82 abroad valued at Rs. 82 lakhs and Rs. 5·7 lakhs respectively for purchase of castings etc. which indicates the value of items which could have been manufactured in the Foundry. This is in addition to the orders off loaded as indicated in para 12.03. With a large number of orders of castings including those for ingot moulds being off loaded to trade, it is high time that the working of the Foundry was geared up to the present requirements and any slackness and imbalances rectified. Proper studies must be made here also like what have been suggested for the CEM Shops and remedial action taken which will go towards reducing the manufacturing costs in the Foundry and less orders being placed outside.

12.14. The Incentive Bonus Scheme for the Foundry also needs a complete review and should be revised, relating it to the efforts of individuals and groups working in the Foundry.

12.15. Another observation which the Committee would like to make is about the present place of the Foundry Department under the Chief Superintendent (Coke & Iron). There seems to be nothing common in the performance of Coke Ovens, Blast Furnaces, and the Foundry and thus requiring coordination between them. Foundry is a department which supplies castings to the entire plant and this is not only limited to the two departments mentioned above. In fact a good lot of castings go to the Machine Shop for machining before despatch to the consuming departments. The Foundry would, therefore, form a much better composite group with the CEM Shops and all of these departments including the Foundry should be placed under the charge of a Superintendent of Shops and Foundry. This is the practice obtaining in some other Plants also.

CHAPTER XIII

MAINTENANCE

13.01. Maintenance is the hand maid of operation and it is axiomatic that to secure profitable operation of any plant, it must receive proper maintenance all the time to keep it not only in a good but in an efficient condition. The saying goes—neglect maintenance and lose the Plant. It is a matter of regret as subsequent events will show that this vital aspect of plant management was sadly neglected at Durgapur, more especially in the Coke Oven Department, with the result that the heavy damage that has overtaken the Coke Ovens has had a very adverse reaction throughout the plant, due to, amongst other things, the serious shortage of coke, gas and pitch. Thus the whole plant has not only failed to register higher and more profitable production with the afflux of time but actually production has considerably fallen during the last one year. Further the plant has been involved in heavy expenditure in major repairs which could have been easily avoided if only the basic principles of regular and preventive maintenance had been practised in the Coke Ovens Department and not sacrificed for registering higher production at any cost.

13.02. Proper maintenance must be regarded as an essential service to production, to ensure trouble free operation of the plant at maximum efficiency, free from breakdowns and non-planned shut downs, and to maximise the availability of the equipments. The time spent in planned shut downs should also naturally be the minimum possible. In a wider sense good maintenance should also cover minor modifications to the equipment and standardisation of parts. It must, therefore, aim at the optimum and full utilisation of the Plant throughout its useful life with minimum shut downs and must also be done in the most economical manner. In fact, maintenance has now acquired its own independent status in productive activity.

13.03. Regular inspection according to a laid down schedule is also an essential part of good maintenance practice. Day to day maintenance and sanitation, lubrication and attention to the correcting of small errors here and there and cleaning of equipment and shop floor are as necessary as planned shut downs. Maintenance Organisation must be able to plan minor and major overhauls in consultation with the Operation Departments in such a way that production is not dislocated. The aim of preventive maintenance should be to conduct things in such a predetermined manner that no breakdowns occur and non-planned shut downs become almost an exception.

13.04. The concept of good maintenance has undergone many changes which have been brought about by prevailing conditions and economics. A detailed study has to be made of every industry and every plant to plan proper maintenance. There should be a correct organisation, proper planning and scheduling based on a system of inspection, records and engineering analysis and the maintenance standards to be achieved. Next would have to be ensured the ready availability of spares and stores, their stocking and ordering on plant's own workshops and outside manufacturers with a view to achieve the maximum efficiency with minimum stocking and expenditure. Against the background of the difficult foreign exchange and the necessity of indigenous substitution of foreign parts, maximum service must, be obtained from the machinery and equipment. Determining the required quantum of maintenance personnel, ensuring their training and equipping them with proper tools and facilities, would be the next steps in the achievement of good maintenance.

13.05. Standardisation has also to be achieved as far as possible and practicable to reduce the stocking of different types of spares. Minor alterations to equipment may have to be undertaken to achieve this. Finally proper budgetting and cost control must be given their due importance.

13.06. The Committee has studied in some detail the organisations for maintenance that obtains in the three HSL steel plants as also in other steel plants and some other industries. It may, however, be emphasised once more that each industry and possibly the different plants of the same industry may need somewhat individual treatment and suitable procedures cannot, therefore, be generalised as of universal application.

13.07. Maintenance of steel plants may be divided into two main sub-sections, *viz.*, Electrical maintenance and Mechanical Maintenance.

13.08. The Steel Plants in the Public and Private Sectors have been maintaining their plants either on the centralised system or the decentralised system or a combination of both.

13.09. In Rourkela, electrical maintenance was centralised right from the very beginning but mechanical maintenance was being done on the decentralised system right up to 1963 when both were centralised and placed under the Chief Superintendent (Engineering) who has under him the Chief Machanical Engineer who is incharge of Mechanical maintenance and the Chief Electrical Engineer who is incharge of Electrical Maintenance. The Civil Engineering maintenance is directly under Chief Superintendent (Engineering) and is looked after by a Manager. The Chief Superintendent (Engineering) has also under him the Water Supply Department, Plant Design Department, Special Investigation Cell and the Spare Parts Cell. The functions of the Operation and the Maintenance Departments are very clearly demarcated. While the Operation Department is responsible and answerable for the production and is required to coordinate various agencies which are needed for production, the maintenance problems and the upkeep of the equipments are entirely the responsibility of the Chief Superintendent (Engineering).

13.10. The preventive maintenance shut downs required on a unit during the following month are drawn up by the concerned maintenance incharge, in consultation with the operational heads, by about the 10th of the previous month. The Energy and Economy Department draw up a draft shut down programme for all the operation departments indicating the best combination of various shut downs; the draft programme is then discussed by all concerned and the programme finally drawn up is circulated to all concerned in due time for implementation. No shut downs are permitted beyond what appear in the programme except breakdowns which may occasionally take place. A system of post audit has recently been initiated to determine if the schedule of shut down jobs are being completed according to the plans. Many of the operating executives there too seemed to be in favour of the Bhilai type of Organisation as subsequently described.

13.11. In TISCO, electrical maintenance is fully centralised whereas mechanical maintenance is decentralised to a large extent with the General Foreman (Mechanical) of the Shop reporting to the Operation Superintendent. In order to give maintenance its rightful place and to strengthen the departmental maintenance organisation, TISCO seem to be favouring the idea that between the Superintendent and the Assistant Superintendent of a Department, one should be a mechanical maintenance man. The Assistant General Supehintenrent (Maintenance) coordinates the work of the Chief Electrical Engineering, the Chief Superintendent (Mech. Maint. Services) and the Chief Superintendent (Engineering Services).

13.12. At Burnpur (Indian Iron and Steel Co. Ltd.), both electrical and mechanical maintenance are fully centralised.

13.13. At Bhilai, the mechanical and electrical maintenance is controlled on the partly decentralised system. The maintenance activity has been classified as follows:—

(i) Shift maintenance consisting of running repairs, scheduled inspection, minor replacements and adjustment of parts.

(ii) Planned Preventive Maintenance (minor and up to intermediate categories) consisting of revisions, planned and breakdown repairs, replacement and modifications.

(iii) Construction and Heavy Maintenance consisting of major revisions, major planned and breakdown repairs, major replacements and modification work.

(iv) Capital repairs consisting of substantial repairs and replacement work involving a long shut down of the plant and machinery, for example Blast Furnace relining, capital repairs of rolling mills etc.

Items (i) & (ii) above which involve day-to-day and planned maintenance are administratively under the control of the Superintendents of the Operation Departments concerned. The Central Organisations headed by the Chief Mechanical Engineer and the Chief Power Engineer respectively, who report to the General Superintendent, control items (iii) & (iv). They have also the mechanical and electrical shops under their respective jurisdictions and are also responsible for providing technical direction and control on the maintenance undertaken by the Superintendents of the various departments. Regular coordination meetings are held for the purpose of coordinating and controlling various matters concerning maintenance in the Departments. As regards item (iv) regarding capital repairs, they are undertaken by separate groups formed for the purpose, who work under the respective Chiefs. It will thus be seen that the Superintendents of the Operational Departments control the working of the maintenance groups earmarked for activity (i) & (ii) but in all the planned shut downs the work is jointly undertaken by these men as well as the special staff and gangs working directly under the Chiefs. Bhilai has also provided posts of Assistant Superintendents (Equipment Planning) in all the Departments, who report to the Operation Superintendents, to look after maintenance, planning and technical coordination and to them the General Foreman (Mech.) and the General Foreman (Elec.) report.

13.14. The Chief Mechanical Engineer has a Deputy Chief Mechanical Engineer (General) who is incharge of the design bureau, lubrication, cranes, tools and tackles, bearings group, buildings and structures and training. He has also a Dy. C.M.E. (Maint.), a Dy. C.M.E. (Shops) and a Dy. C.M.E. (Equipment Planning). He has also an Inspection Officer who is incharge of the Inspection Groups.

13.15. The Chief Power Engineer who directs the maintenane activities and the power facilities of the Plant has under him a Dy. C.P.E. (Elec.) for heavy maintenance, a Dy. C.P.E. (Mech.) who looks after heavy mechanical maintenance etc., a Manager for gas facilities, a Manager for Water Supply and a Manager for Oxygen Plant and Technological Pipe Lines, together with the appropriate number of executives who look after various maintenance planning and inspection jobs.

13.16. The main highlights of the system are that the maintenance planning groups under the C.M.E. and C.P.E. carry out the inspection of plant and equipment and make lists of defects noticed. These along with the defects list obtained from the Shop maintenance personnel constitute the schedule of repairs to be carried out. Annual maintenance plans are prepared in advance and based upon these monthly preventive maintenance schedules are jointly prepared by the concerned Officers. These are approved by the General Superintendent. The fulfilment of the plan is insisted upon and the Committee was told that at present the fulfilment is about 90 per cent. In some cases, even 5-yearly schedules have been made out.

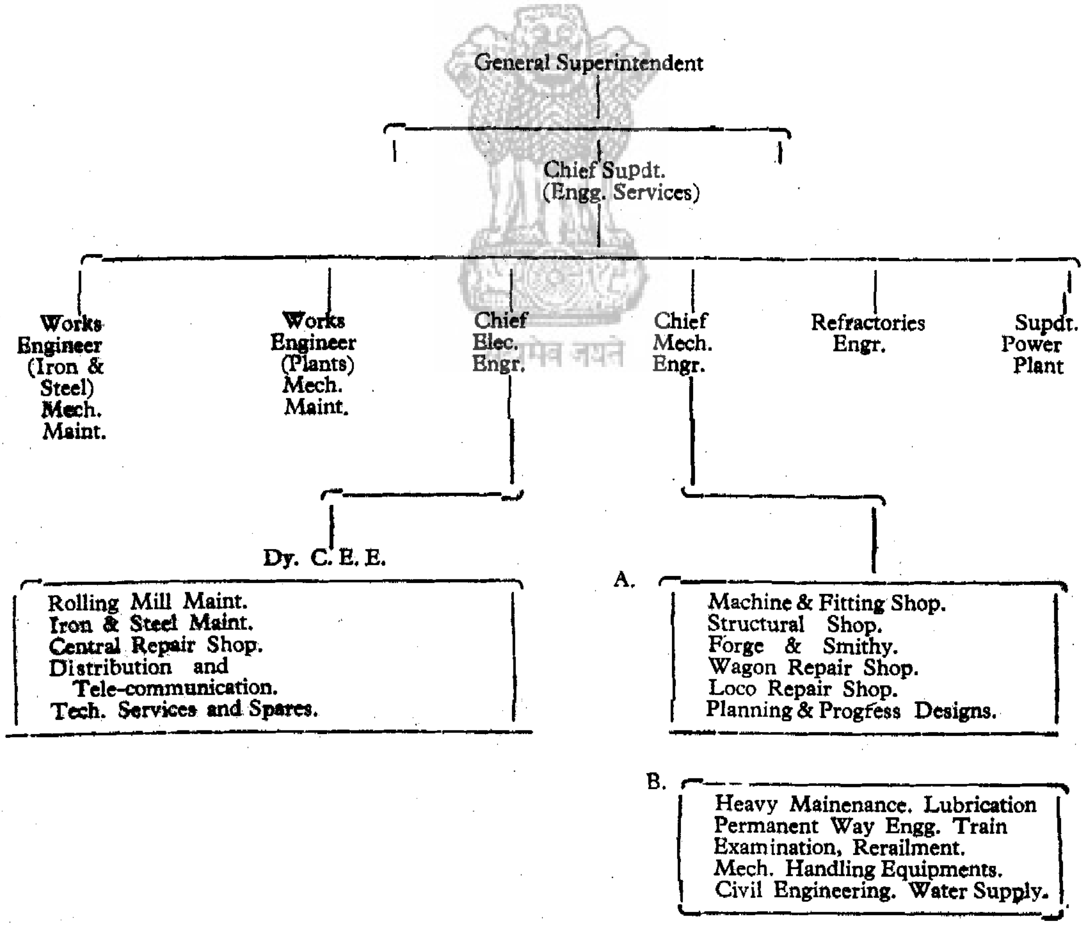
13.17. The effectiveness of the system at Bhilai can be further judged by the following data relating to the delays in their mills:

	Mech. delays	Elec. delays	Other delays	Total
	%	%	%	%
1963-64	2·2	0·9	24·3	27·4
1964-65	2·0	1·0	25·5	28·5
1965-66	1·6	1·1	17·1	19·8

A pattern of this type also ensures better utilisation of manpower and development of specialised skills and know-how in the respective areas of Mechanical and Electrical Maintenance. It enhances the effectiveness of technical advice, guidance and control over shop maintenance, yet freeing them to devote adequate attention to the day to day and preventive maintenance. The General Foreman in-charge/Assistant Superintendents (EP) attached to the Shops receives technical instructions from the C.M.E./C.P.E., who exercise full control and directions over their work. It has been made clear in printed documents that the C.M.E. and the C.P.E. are the Chief Technical authorities on maintenance matters pertaining to Mechanical and Electrical equipments repectively. While the operational efficiency is the responsibility of the Shop Superintendents, the efficiency of the up keep of the equipments and facilities is the responsibility of these authorities. They are also regarded as providers of reinforcements to the management of maintenance in the respective shops and are looked upon as Chief Advisers of the Management on these jobs. To enable these functionaries to discharge the responsibilities effectively certain rights have been conferred on them including, *inter-alia,* the authority to give instructions to the shops and departments on problems concerning the running repairs of equipment and to expect their fulfilment, to consider maintenance schedules, to approve schedules of preventive inspection equipments etc.

13.18. At Durgapur, the initial organisation was a decentralised one; the Superintendent of each Department having full charge of operation as well as maintenance responsibilities, both electrical and mechanical, including ordering of spares and equipment. In case of major breakdowns, the Chief Electrical Engineer and the Chief Mechanical Engineer used to be called in. The Departmental Superintendents attended to minor repairs and day to day maintenance. On 10th September, 1962, the electrical maintenance of the Steel Melting Shop was transferred from the charge of the Superintendent to the Chief Electrical Engineer. On 17th December 1962, similar transfer took place in the Coke Ovens; on 1st April 1963 in the Blast Furnace; on 22nd July, 1963 in the Rolling Mills and this completed the centralisation of electrical maintenance under the Chief Electrical Engineer. On the mechanical side, the mechanical maintenance of the Steel Melting Shop was transferred to the Assistant General Superintendent (Maintenance) on 10th September, 1962. Similar action was taken on 2nd September, 1963 for the Coke Ovens; on 14th December, 1963 for the Blast Furnaces, the Rolling Mills and the Wheel and Axle Plants. On 30th November, 1963, the Chief Electrical Engineer was also placed under the Assistant General Superintendent (Maint.). A month before the departure of Mr. P. H. Welch, A.G.S. (M) on 11th October, 1966, the post was redesignated as Chief Superintendent (Engineering Services) and centralised electrical and mechanical maintenance continue under the direction and control of this Officer. With the creation of the post of Assistant General Superintendent (Maint.) a Plant Inventory Cell and an Indigenous Procurement Cell were also established but these Cells have worked in a rather leisurely fashion.

13.19. The existing maintenance organisation as it has by now evolved in Durgapur is shown below:


General Superintendent
Chief Supdt. (Engg. Services)
Works Engineer (Iron & Steel) Mech. Maint.
Works Engineer (Plants) Mech. Maint.
Chief Elec. Engr.
Chief Mech. Engr.
Refractories Engr.
Supdt. Power Plant
Dy. C. E. E.
Rolling Mill Maint.
Iron & Steel Maint.
Central Repair Shop.
Distribution and Tele-communication.
Tech. Services and Spares.
A.
Machine & Fitting Shop.
Structural Shop.
Forge & Smithy.
Wagon Repair Shop.
Loco Repair Shop.
Planning & Progfess Designs.
B.
Heavy Mainenance. Lubrication
Permanent Way Engg. Train Examination, Rerailment.
Mech. Handling Equipments.
Civil Engineering. Water Supply.

As has already been mentioned, all the maintenance work is now centralised under the Chief Superintendent and all the Mechanical Maintenance personnel working at the plant level report to the Works Engineers and none of the maintenance staff are under the administrative control of the various Operation Superintendents.

13.20. The Committee would like to observe that while a major decision was taken to centralise the mechanical maintenance, possibly because full satisfaction had not been obtained from the totally decentralised matinenance as was in vogue, no deliberate studies appear to have been made to work out the requirements of the new set up and to lay down the procedures in detail and also to make them known to all concerned. The maintenance in Durgapur today is still in a state of confusion, which the present Chief Superintendent (Engg. Services) is trying to remedy. Even the basic principles of planned preventive maintenance have not yet been fully applied nor are detailed forecasts being made of the preventive maintenance programmes and in a way therefore *ad-hoc* measures are only being adopted. The best methods for overhaul of every piece of equipment including description of tools, parts, and manpower requirements are not yet being attempted nor is any effective training being imparted to maintenance men and supervisors. An analysis of performance and costs is still to be done on a rational basis. It has been the impression of the Committee that the maintenance staff are not yet being fully and effectively utilized. At this stage it may be appropriate to indicate the per cent downtime of various Mills at Durgapur which is rather high:

Mills	1964-65	1965-66
Blooming Mill :		
(i) Mech. delays	9·5	14·7
(ii) Elec. delays	1·8	3·1
(iii) Operation delays	36·3	28·9
(iv) Total	46·5	46·7
Billet Mill :		
(i) Mech. delays	1·6	2·5
(ii) Elec. delays.	0·6	0·8
(iii) Operation delays	62·1	63·8
(iv) Total	64·3	67·1
Section Mill:		
(i) Mech. delays	5·8	7·1
(ii) Elec. delays	1·8	1·3
(iii) Operation delays	26·3	28·8
(iv) Total	33·8	37·2
Merchant Mill :		
(i) Mech. delays	5·7	4·5
(ii) Elec. delays	1·5	1·3
(iii) Operation delays	31·8	31·7
(iv) Total	39·2	37·5

13.21. As regards the availability of spares, the work has still to be tackled in an organised and rational manner inspite of the fact that two Cells mentioned in para 13.18 were created long ago. This matter has been dealt with in detail in Chapter XIV. The role of CEM Shops and the Foundry so vital for the maintenance of the Plant has been discussed in Chapter XII, where a recommendation has been made that the Foundry and the Shops should form one group. For this purpose it will be necessary to redesignate the C.M.E. as a Superintendent (Shops and Foundry) and some of the present functions of the C.M.E. indicated in box (B) under para 13.19 will have to be transferred to other officers performing allied functions.

13.22. The Committee had asked all the Departmental Superintendents and Managers and the Senior executives regarding the effectiveness of the system of maintenance adopted at Durgapur. It was almost unanimously their view that the electrical maintenance which requires specialised know-how should better be left under the care of the Chief Electrical Engineer in the centralised set up but the mechanical maintenance be changed over to the Bhilai or TISCO pattern. This would mean in practice that in the bigger departments, the maintenance incharge up to the level of General Foreman would report to the Operation Superintendents and work under his guidance but also take technical directions and necessary help from the centralised organisation. It was pointed out by them that this should enable the maintenance personnel to have a sense of belonging to the particular department where they work and the responsibility for good maintenance will also pass on to the Operation Superintendents, which will, according to them, do away with the present friction and be conducive to better outturn from the maintenance men and better production from the Plants.

13.23. The Committee was greatly impressed by the efficient manner in which the preventive maintenance work was being done in Bhilai, After seeing the working of the other plants also, the Committee is of the view that the system at Bhilai is the best system to be adopted for the maintenance of the Steel Plants. In the case of Durgapur, as far as the electrical maintenance is concerned, no change is called for. As regards mechanical maintenance, the Committee would not like to make a definite recommendation at this stage that the present fully centralised system would immediately be replaced by a mixed system as at Bhilai. What is immediately needed is that the Centralised Maintenance Organisation must be geared up to discharge its duties in an efficient manner, to arrange for the spares etc., well in time to develop competence in the men by proper supervision, training, and forming the men in the pool into specialised gangs and above all by rendering the required service to the Operation Superintendents to their satisfaction. When this is done, the change over to decentralised system, if the plant would like to adopt it with further experience, would be a small matter of internal reorganisation persenting no special difficulties.

13.24. The Committee would like to emphasise the necessity for the setting up of an Inspection Organisation in the Durgapur Steel Plant for making detailed periodical inspections, according to prescribed schedules, of the state of Plant assets *e.g.*, buildings, structures and the major items of equipments including material handling equipments. This Organisation should indicate clearly in its reports the shortcomings that have been noted and the remedial action that has to be taken and further the action taken will have to be duly reported to it. It is also for consideration if this Organisation may also be entrusted to occasionally check up the major running repairs being carried out in the Plant with a view to see that the required replacements have been made and the work has been carried out satisfactorily. This Organisation will be in addition to the Inspection Groups of the Maintenance Organisation itself, which keep a regular watch on the condition of the equipments and repairs. For performing its tasks in an effective manner this Organisation should be directly under the General Superintendent and be independent of the Chief Superintendent (ES). It is also for consideration if the Safety Department may be made a part of this Organisation.

CHAPTER XIV

MATERIALS MANAGEMENT

14.01. Materials management is concerned with providing to the Plant different kinds of materials required at the various stages of manufacture in required quantities, of requisite quality, and in proper sequence, and to maintain right stocks of the materials and to ensure their safe custody. The Controller of Purchase and Stores of the Steel Plant looks after the purchase and stores functions of spares and stores and manuals have already been prepared laying down rules and procedures for guidance. The programming, storing and accounting of raw materials is looked after by the Raw Materials Department under the Superintendent, Traffic and Raw Materials. The principal materials for which the materials management is responsible are raw materials including coal, iron ore, fluxes, manganese ore and spares, stores, rolls, refractories etc.

14.02. As will be seen in Annexure V-A, the overall material productivity in Durgapur has been more or less the same, which shows that concerted efforts have still to be made to bring down the consumption rates. The actual consumption rates and norms for usage for various raw materials have been given in the performance tables of the various shops and departments. Not only it is necessary to provide stricter norms gradually, but efforts will also have to be made to prevent any increases in the consumption rates.

14.03. As regards the quality of raw materials the Committee understands that the quality of coal supplied to Durgapur has been deteriorating, leading to partly a fall in the yield of washed coal and partly in higher ash content in coke. This is a factor on which the Plant seems to have no control. It was also brought to the notice of the Committee that the grade of coal actually being supplied to the Plant has also generally been inferior to its declared grading, resulting in substantial over payments made by the Plant to suppliers. Persistent efforts were stated to have been made to sort out this difficulty jointly with the Coal Trade but unfortunately Coal Trade does not seem to be interested in any system of joint sampling. This aspect has been emphasised by the Mehatab Committee also and the Committee would only repeat that joint sampling at destination must be made obligatory and payments made in accordance with the actual quality supplied. To meet the deterioration in the inherent quality of coal, adoption of the much recommended system of selective preparation of coal should be actively considered atleast on an experimental basis.

14.04. The Committee also hopes that with the taking over of Bolani Ores by HSL, it should be possible to have control over the quality of Iron ore and also instal the much needed benefication Plant to make available beneficiated fines to the Sintering Plant at Durgapur, which is to be commissioned shortly.

14.05. The inspection wings for inspection of raw materials will have to be strengthened to provide both quantity and quality control over the raw and other materials.

14.06. The table at Annexure XIV-A gives the purchases made and the consumption of items like rolls, refractories etc. mentioned there. It will be seen from the table that the consumption of certain stores is unduly high and is rapidly on the increase. Also the case of type spares and other consumable spares illustrate over-indenting.

14.07. The Committee has studied the extent of inventories carried by Durgapur Steel Plant. The raw material inventories at Durgapur are generally not high but there is enough scope for reducing the inventories for stores and spares and of finished and semi-finished products. Detailed recommendations in this regard have been already made in the Report of the Mehatab Committee. The Committee would however emphasise the following:

14.07. (i) **Stores and spares:** Special efforts may be made to utilise or dispose of slow moving items which are on hand to the extent of about Rs. 50 lakhs. Since the actual utilisation of these items has been very slow, it may be worthwhile disposing them off even at some loss if alternative use cannot be found in the Works and the other Plants. The management has also to ensure that there is no further accumulation of such slow moving items including diversions from the expansion programmes.

14.07. (ii) **Finished and semi-finished products**: Although the market conditions for certain items are not quite good, the stocks of finished and semi-finished products can be reduced if greater attention is paid to the quality of products as quite a large quantity of items is lying in stock because their quality is not good enough. The off-grade stock of different materials, *e.g.*, stock of blooms, should be disposed of either by sale in the market as off-grade material or by consuming them in the Plant. In the case of a few specific items special efforts would be needed to reduce their stocks. These are nut and pearl coke valued at Rs. 55 lakhs, stocks of ingots which was about 90,000 tonnes towards the end of December, stocks of sleepers and the work-in-process in the Wheel and Axle Plant.

14.08. A few more suggestions that may help the function of materials management are given below:

14.08. (i) The placement of a repeat order on a successful supplier is limited to only 3 months at present. Unless an *ad hoc* order comes, repeat order cannot be placed and advantage of having developed a good source is lost when supplies have to be switched over to a new party because it has quoted a slightly lower rate. The Committee would recommend that the period for a repeat order should be raised to about one year. In fact, it might be worthwhile entering into long term rate contracts with well known suppliers to ensure continuity of supplies and quality and save the buying effort.

14.08. (ii) At present all transport and material handling equipments are under the control of the Chief Mechanical Engineer who makes them available to the Stores Department against their standing demands. It was pointed out by the Controller of Purchase and Stores that shortage of equipments with Stores Department affects their work and it would be better to earmark certain equipments for the Stores Department. Maintenance of course will still have to be with the Chief Mechanical Engineer. This may be considered.

14.09. The Committee has already emphasised in Chapter XIII, the importance of ensuring that the right kinds of spares in required quantities are made available to the maintenance staff. Besides gearing up efforts to obtain better output from CEM shops and Foundry, it is essential that procurement of spares from outside sources must be placed on an efficient footing. One of the main bottlenecks in obtaining timely supplies has been the preparation of drawings. It was found that a large number of drawings, which had not been supplied by the equipment suppliers, had still to be made and it was the intention that this work should be done by contracting firms but a decision was pending for an unduly long time. Similar was the case in regard to import substitution. The Committee suggested to the General Manager to consider the setting up of a high level Organisation immediately with the functions detailed in the Annexure XIV-B.

14.10. A tight time schedule will have to be indicated to this Organisation. As soon as its work is finished, it may be broken into two sections:

(a) The Equipment Planning Section may be organised under the CS(ES). This should concern itself with keeping of drawings, collection and keeping of equipments data, service records of equipments, analysis of failures and improvement in life, preparation of maintenance manuals, instructions etc. The existing Indigenous Procurement Cell attached to the General Superintendent may be merged in this Section.

(b) The Spares Procurement Section may be placed under the charge of the Controller of Purchase and Stores and may be entrusted with the cataloguing of spares, inventory control, requisitioning procurement, stocking and issue of spares. The existing Plant Inventory Cell under General Superintendent may be merged in this Section. For the purpose of coordinating the efforts of these two sections, a Planning Committee may be formed consisting of CS(ES), COPS and one or two Operation Superintendents. This Committee should take final decisions on the spares to be maintained and which out of these should be manufactured in the CEM Shops and which have to be obtained from outside.

CHAPTER XV

PRODUCTION PLANNING & CONTROL

15.01. Production Planning & Control is a staff function of management and is concerned with (a) the preparing of coordinated operating plans for the Plant, (b) following up to ensure that the plans laid down are fulfilled and (c) assisting higher management in controlling production including flow of materials and dispatches. The importance of this function has been realised by all manufacturing industries and a department for production planning and control may be found in almost all the Plants in some form or the other. The pattern of organisation for such a department, its place in the overall plant set up and the systems adopted for planning and control would largely depend upon the type of industry and would also vary from plant to plant within the same industry. Therefore the organisation and the systems to be adopted have to be tailor-made to suit the requirements of the individual plant. In case of a multi-plant company, however, greatest benefits may be derived by creating similar patterns for all the staff/service departments, including production planning and control in all the plants. This would permit the maximum growth of knowledge, helpful assistance from the headquarters, and interchangeability of managerial personnel.

15.02. Some salient features of a good Production Planning & Control set up are given below:—

(i) Sales forecast and anticipated customer requirements provide the basis for Production Planning and not what the Plant has been designed to produce.

(ii) Besides long term plans covering a period of say 2-5 years, annual plans are prepared based on the sales forecast. The annual plans again are to be broken down into quarterly, monthly and daily plans. It is best to have a deliberate and detailed review of the Plans once every quarter, making available to the Plant one year's programme at any one time.

(iii) Those engaged on preparation of Production Plants, besides possessing adequate knowledge of the equipments, materials, processes, and market conditions must have cost consciousness as one of their most important attributes. Therefore these men are better drawn from the operating departments and specially trained for this purpose.

(iv) Once a plan has been approved by the management, all efforts have to be directed to ensure that the programmes are fulfilled to the maximum extent possible instead of circumstances altering the plan every now and then. For this purpose and to improve the quality of plans, periodical fulfilment reports have to be prepared indicating the deviations from the approved Plan and the forces working against it.

(v) The system of control should be such as would enable round-the-clock information being available to the management so that timely corrective action may be taken, bottlenecks and disruptive forces removed and the flowline smoothened. An efficient communication system is, therefore, one of the essentials of a good Production Control System.

(vi) The Production Control staff should have the necessary authority delegated to them so that the activities of various sections/shops could be coordinated by them on behalf of the management.

15.03. The Committee has made a comparative study of the organisations and systems for planning and control of production at the other steel plants. Organisationally, it was found that in all of them, there is a department under the General Manager usually called the Order Department, whose principal function is liaison work between the Sales Office and the Production departments. The existing department of Production Planning at Durgapur performs somewhat similar functions as an Order

Department. The Order Department is under a Commercial Manager/Deputy General Manager, who reports to the General Manager in respect of several other functions, in addition. There is also a department of Production Planning and Control which in case of Bhilai is headed by a Superintendent reporting to the General Superintendent of the Plant. In case of Rourkela, the pattern is somewhat different in as much as they have in position a Chief Superintendent (Tech. Administration), under the G.S., who directs and coordinates the work of two departments *viz.* Production Planning and Control, and Energy and Economy. In fact, the department of Production Planning and Control at Bhilai was originally called the department of Energy and Economy and took its present shape in 1965. It does not deal with gas facilities, instrumentation etc. The Energy and Economy Departments at Rourkela and Durgapur perform more or less similar functions *i.e.*, compilation of date and statistics, control on gas and fuel supply, and maintenance of instruments.

15.04. The Committee was quite impressed by the system of Planning and Control adopted at the other steel plants particularly at Bhilai. The work of the Production Planning and Control at Bhilai is divided into four groups *viz.* Production Planning, Production Control, Prodn. Statistics and Technical Appreciation. The primary function of the Production Planning group is to coordinate and assist in the preparation of monthly and quarterly plans on a continuous basis. The monthly programmes are in the first instance worked out by the concerned departments in consultation with the Order Deptt. and Production Planning and broadly follow the approved annual perspective plans worked out earlier by the Design and Planning Department. The draft plans are worked out on the basis of production possibilities taking into account the order position, resources, schedules for maintenance and major repairs, availability of gas, commissioning of new units etc. These are made available by the 10th of the month preceding to which they relate. After the draft plan has been discussed by the General Supdt. with the departmental heads, it goes to the General Manager, who also has available to him, in the meantime, a cost plan prepared on the basis of the draft production plan. After the draft plan has been approved by the management, it issues as an action document for the month. Thereafter the detailed monthly plan is worked out, which is further broken down into daily shift and hourly schedules.

15.05. Bhilai has established an elaborate system for Plant control to ensure that the plans laid down are realised to the greatest extent possible. It consists of the following:—

15.05. (i) Round-the-clock follow-up through the inter-communication despatcher system, which connects all production control posts at important points in the shops to the Central Production Control.

15.05. (ii) The Central Control, besides other staff, is headed by an Assistant Superintendent in each shift and all control posts are manned round the clock. All information on the plant performance is constantly transmitted to the Central Control who (a) ensure quick and timely checks on compliance of the plan, (b) cause timely corrective action to be taken, (c) make available assistance, as required, and (d) pass on information to higher authorities as required, seeking instructions.

15.05. (iii) Every morning at 9-00 a.m. the General Superintendent conducts a meeting over the Central Production Control system on which are connected all the Departmental Superintendents/Managers. The Assistant Superintendent on duty in the Central Production Control prepares a complete report on plant performance for discussion in the meeting. The departmental heads take part in the conference while they remain in their own offices. The G.M. can also participate any time he likes. In the meeting the performance of the previous day is reviewed and general plant problems are discussed.

15.05. (iv) The meeting helps in identifying good performance, problems of production, quality and raw materials etc. It also enables the General Superintendents to give necessary instructions to provide help and to isolate areas where further action has to be taken by him after inspection if necessary.

15.06. The planning at Rourkela is somewhat similar in nature to that at Bhilai. In preparing the monthly targets not only the production trends, availabilities of equipments, process inventory levels etc. are kept in view, but the relative economics of the product-mix are also examined every month. Rourkela also installed in 1964 a Plant Control system on the lines of Bhilai but the shift Incharges are of a lower level. There is also the difference that the General Superintendent holds his daily meetings with the departmental heads by calling them into a conference and not on the plant control system. There is a constant flow of information from each shop to the plant control on the ordinary plant telephone system and this information is made available to all the top executives for the purpose of information and decision making. The daily performance is compiled into a detailed statistical report and the reasons for low production, delays etc. are discussed in detail in the daily production meeting held everyday and presided over by the G.S. in which corrective action is decided upon. Weekly meetings are also held in addition by the General Superintendent in which the week's performance, shortfalls, delays breakdowns etc. are discussed.

15.07. A department of Production Planning already exists at Durgapur and the Superintendent of the Department reports to the General Superintendent of the plant. This department was created in March, '65 after abolishing the original Order Department. The functions of the department include, *inter alia,* planning of rolling and dispatch programmes, coordinating the day-to-day flow of steel to the Mills and liaison with Sales Office and the various production and other departments of DSP. The department has no responsibility for production planning of the departments other than Mills nor for the integrated planning of the entire works. In fact, the Production Planning Department has very little to do with actual production or planning of operations. The annual production plans are prepared by the Departments concerned, consolidated at the levels of the Chief Superintendents, and finalised in the office of the General Superintendent. Monthly targets of production are then derived out of the annual plans. The departmental heads are no doubt consulted in the preparation of the monthly plans. A study of a monthly production plan shows that the document does not contain some of the ingredients of a complete plan and the required sanctity is not created around it.

15.08. The system used for controlling production and for coordination at Durgapur consists of (i) the consideration of daily performance reports submitted to the management each morning by the Energy & Economy Deptt., (ii) meetings and conferences at various levels and (iii) visits to the Plant. The General Manager holds daily technical meetings in the General Superintendent's office with the General Superintendent, Chief Superintendents, and the Controller of Purchase and Stores for the purpose of reviewing the performance of the previous day, resolving difficulties that have arisen, and for coordination. The General Superintendent holds fortnightly coordination meetings with the heads of departments, in which the requirements of each department and bottlenecks are discussed and decisions taken for future guidance. The Committee understands that the General Superintendent proposes to hold weekly meetings in future. In addition to these meetings the Chief Superintendents hold their own meetings with their departmental heads, often held every day. Unscheduled meetings are also held between the top executives and the departmental heads concerned.

15.09. The statistics on production and stocks are maintaned by the Energy and Economy Department who render monthly reports on production and performance to the management. In addition the Department of Production Planning also compiles periodical reports on production, testing, despatches etc.

15.10. The Committee is of the view that the production planning activity which in Durgapur is at present being performed at different points of the Works in a piecemeal fashion could better be done by a centralised department of Production Planning and Control under the General Superintendent. This department would coordinate and integrate the departmental plans into an effective plan which would provide the basis for systematic control at the level of the G. S. The production plans obviously have to take into account the aspects relating to consumer demands and economics of production besides the requisite technological factors.

15.11. The Committee also feels that to be able to control production effectively in a gigantic steel plant on continuous production, it is essential that the top management are fully aware of the conditions at the shop floor and the performance of the various shops all the time, so that necessary follow-up, coordination and control measures could be taken in time. The flow of information to a central point is the single most important ingredient in the control of production. The existing system of production control at Durgapur leaves a lot to be desired, because the very basic requirement *i.e.* smooth and speedy flow of information regarding shop performances, problems and bottlenecks, to a central point or desired points is almost non-existent. In fact the Production Control Cells attached to the various departments are not working under a unified control—the Cells in Coke Ovens and Blast Furnaces are attached to the concerned operation departments and those attached to the Steel Melting Shop and Blooming Mill form part of the Industrial Engineering Department.

15.12. In the opinion of the Committee the organisation and system of production planning and control adopted at Bhilai provides the real answer in the complex set up of a steel plant. The Committee therefore recommends that the management should depute a few senior officers to study the systems in vogue at Rourkela and Bhilai in order to install an effective system at Durgapur. In the discussions held with the Plan Management and Superintendents at Durgapur the efficacy of the Communication and Plant Control system of Bhilai was brought out and a point made that it should also be installed at Durgapur without any further loss of time. The cost of its installation may be about Rs. 2 lakhs and cost should be no consideration. The Committee understands that the present Head of this organisation at Bhilai has just retired and the management may consider utilising his services on contract basis for a period of 4 to 6 months for setting up a suitable system at Durgapur.

15.13. At present information on plant performance, stocks, dispatches etc. is kept by several departments which at best, is only a duplication of effort. The object of collection and presentation of information is to enable progressively better planning and control and this can be best achieved by making only one agency viz., the Statistical Section of the existing Energy and Economy Department responsible for collection, analysis and presentation of data to the management.

15.14. On the organisational side the Committee would recommend, as a first step, an immediate placement of the Departments of Production Planning and Energy and Economy under a new post of the Asst. General Superintendent responsible to the General Superintendent for coordination of all Plant activities. The production Control Cells should also be placed under the Department of Production Planning. At a later stage, however, the direct maintenance functions of the Energy and Economy Deptt. viz. Gas facilities and Instrumentation may be transferred to the Chief Electrical Engineer who may be redesignated as Chief Power Engineer as in case of Bhilai. Due recognition to the Production Planning and Control function has to be given and adequate authority and status granted to it.

15.15. The Committee is of the opinion that the services of this Department should also be utilised for codification, upkeep and issue of all operation and maintenance instructions, procedure orders etc., which are of common use by the various departments.

CHAPTER XVI

PERFORMANCE CONTROL AND DEVELOPMENT

16.01. Peformance Control and Development are major functions of management and provide important aids to it in realising its objectives viz., to produce quality goods to suit customer requirements, in prescribed quantities and according to a preplanned schedule, and to produce them economically. Performance control and development involves collection of data on use of resources and outputs, setting up standards against which the actuals can be measured, determining variations from standards and ascertaining causes of deviations and shortfalls. The object is to ensure that the actual performance conforms as closely as possible to the expectations and plans. The other important aspect is that of development, which is aimed at progressively upgrading the performance once it has been assessed i.e., if there is any short fall to bring it up to normal levels and then to take it through peak performance to higher levels of attainment. By its very nature it would appear that performance control and measurement is a function which should concern and involve everyone in the organisation, particularly those who are directly in-charge of operations. In their endeavour to discharge their objectives the operating staff have to be suitably aided, guided and counselled by some other departments which are concerned largely with improving performances in terms of quality, efficiency and economy.

16.02. With the growth in the size of an organisation such staff department must assume bigger roles, freeing operating personnel to concentrate mainly on proper plant operation and maintenance. The organisation for such departments and the nature of service they render varies from industry to industry, but the value of the contribution made by departments like Research and Control, Industrial Engineering, Energy and Economy, Internal Audit Management Audit, etc., in this respect has been realised by all management. In the Steel Industry in India all the plants have set up these departments although they vary in the details of the work done by them and in their organisational relationships.

16.03. The Energy and Economy Department at Durgapur consists of three main sections namely (a) Instruments, (b) Fuels, Gas Safety and Light Maintenance, and (c) Statistics. While supply of fuel and gas and maintenance of pipe lines and instruments throughout the plant are the line responsibilities of this department, the work of collection and analysis of performance data and presentation to the management is of an advisory nature, based upon which decisions are taken by the Operation Superintendents or the General Superintendent. Information is also supplied to other agencies and organisations who may need to use them. Although this department works as a central point for collection of information in many cases the information does not come to them easily, and has often to be obtained through personal contacts. The organisation and functions of this department are comparable to that of its counterpart in Rourkela, but there is a greater scope for this Department to be brought into the picture for drawing up of the production and maintenance schedules of the plant. The functioning of this department could be made more effective if they take full part in preparation and coordination of production plans and schedules, in analysing causes for shortfalls in performance and assisting management in getting over them. It has been proposed laer in the report that the Department should be merged with the Department of Production Planning into a Production Planning and Control Department with some of its present functions transferred to another department.

16.04. The Industrial Engineering Department at Durgapur has been in existence since 1960. The department is generally concerned with the application of Industrial Engineering techniques like Works Study, Operational Research, Job Evaluation, Bonus Schemes etc., and providing service in these areas to other departments. The Industrial Engineering Department in DSP got off to a fairly good start with the engagement of M/s. Urwick Orr and Partners, a British firm of consultants under the Colombo Plan, who were in Durgapur from 1960 to 1963 and were responsible for the conduct of several studies.

In the evidence before the Committee, however, it became clear that not much use is being made of the services of this Department and whenever studies have been made by the Department and reports submitted to the Management, their implementation has not been quite satisfactory. It would appear that the Department of Industrial Engineering has been working on ad-hoc assignments and not on a planned and deliberate basis for effecting improvements in planning, operation and maintenance. This is perhaps so because the Management had hardly any time left to it to devote to these areas, being fully occupied with maximising production and attending to their numerous day to day problems which are multiplying against the back-ground of increasing labour problems. In fact in most of the Plants and also in other industries the potentialities for the use of this agency have not yet been fully appreciated. This also reflects in the status accorded to this function and in the prospects available to the Industrial Engineers in the organisation. It is, however, a good augury that regular meetings of the Chief Industrial Engineers of the Steel Plants have recently been started. The Committee hopes that this function would receive adequate attention of the Management, and the Industrial Engineers would make their due contribution, which would go a long way in improving productivity and reducing costs.

16.05. In Durgapur, Manpower Planning is being done by the Manpower Planning Cell under the Personnel Department. The Committee feels that Manpower Planning being a specialised function, is better done under the aegis of Industrial Engineering Department wherever such a department exists separately. Industrial Engineering Department, on the other hand, looks after the Production Control Cells at the Steel Melting Shop and the Soaking pits, which function should rightly belong to the centralised department of production Planning and Control.

16.06. The usual counterpart of the Industrial Engineering Department is an Organisation and Methods Section for impovement of the efficiency in the offices, and it would be useful to create such a section under the Industrial Engineering Department.

16.07. Since Industrial Engineering is concerned with rendering service to all the departments of the Steel Plant in improving their operations, practices and procedures, it is only at the level of the General Manager, that full use can be made of this agency. Moreover its primary function is to assess the performance of various units and departments and it must therefore occupy a place from where criticism could be made without any reservations.

16.08. The Research and Control Laboratory has its functions divided into three sections namely :—

(i) Chemical Section under the Chief Chemist, who is responsible for sampling and analysis at various stages.

(ii) Metallurgical Section under the Assistant Chief Metallurgist, who is responsible for the metallurgical processes, quality control and testing and certification of end products.

(iii) Inspection Section under the Chief Inspector, who looks after physical inspection of all tested quality products for the Mills and Wheel and Axle Plant.

16.09. The organisational set up and the functions of the Department at Durgapur are, by and large, similar to the corresponding departments of other steel plants in the country, the main aim being to achieve predetermined quality standards for all products and to maintain the same. As indicated in Chapter X the percentage of off-grade production at the mills is more than 20 per cent which not only reduces sales realisation but may also affect sale of Bhilai products since the customers seem to be preferring off-grade material owing to lower prices. The main problem seems to be rolling of products, mainly angles and joists, not to correct profile. Customer complaints regarding quality of products from DSP are also known. The Committee feels that in the rush for achievement of rated outputs, the Department of Research & Control has not been able to play its part effectively in ensuring that the quality of products is safeguarded. Even normally and more so with the present glut in the Steel market, the emphasis should change to quality production and customer satisfaction and this can be achieved only by making the quality control and inspection set-ups more effective at the different stages of iron and steel manufacture. In case of Wheel & Axle Plant there is a need for introducing inspection at the intermediate stages wherever it is not there and to make inspection more intensive at the other points in order to cut down the ultimate rejections. It might be worthwhile considering if the quality control staff can be regularly inter-changed between the Blooming Mill & the Wheel & Axle

Plant on the one hand and the Steel Melting Shop on the other, so that the difficulties on either side could be better appreciated and remedies found out. This is the practice at least in one of the Plants visited by the Committee and has been found very effective there.

16.10. In order to increase the effectiveness of the Research & Control Laboratory, the management may consider establishment of a separate wing in the depertment for carrying out investigations into failures on the metallurgical and chemical fronts. Also in appointing the personnel to this department it would be preferable to have some recruitment made from amongst those who have sufficient experience on the production line. Similarly, the inspectors may be given wider knowledge of the production processes and products at Durgapur by rotating them in the various departments.

16.11. One more factor that has been discussed several times by the Committee is the place of this department in the overall Plant organisation. Opinions differ on this account, but it is generally accepted that quality control and inspection functions should be kept independent of the head of the production organisation, otherwise there may be a danger that the quality concepts may get affected. Also considering the quality standards attained by DSP, the Committee is of the view that the Chief Metallurgist along with the other heads of the Efficiency Deparments should report to the General Manager as proposed in Chapter-XVI.

16.12. The various units under the F.A. & C.A.O. have a special role to play in achieving economic and efficient working of the plant. They render advice to the line executives in their delegated areas and also conduct periodical reviews, analysis and special studies aimed at achieving economy and efficiency. Unfortunately in Durgapur, as in several other places, the P.A.'s Division is not ordinarily looked upon as an integral part of the management and as one rendering useful and constructive advice to the executives concerned. In the interest of efficient working of the plant and for utilising the potentialities of F.A.'s organisation fully, it is essential that a change of attitudes takes place on all sides. The Internal Audit Section under the F.A. & C.A.O. is concerned with ensuring the accuracy of basic records as well as the systems and procedures having financial implications in the various departments. Obviously, Internal Audit will confine its activities to the procedures in the various offices and will not concern itself with the other management systems and aspects for improvement of efficiency, mostly technical in character. At present, the Internal Audit at Durgapur concentrates only on the work of the Accounting Sections, for checking the accounts, clarifications etc., and the audit of the other departments of the works, the Township and Administrative Departments has not been taken up on a regular basis. The Committee is, however, glad to note that the management has decided to reorient and reorganise the Internal Audit to cover all the departments in the organisation and to make it an effective and useful instrument for assisting the management and for this purpose a detailed programme for Internal Audit for the year is being worked out.

16.13. A suggestion scheme has been in operation at Durgapur for some time past. For this purpose, a permanent Suggestion Committee has been formed. Suggestions received in the suggestion boxes provided in the different units of the Plants are collected by the Secretary of the Committee who puts up the suggestions after necessary screening. Suggestions which are found useful and economical are implemented and rewards given to the employees concerned. The employees upto and including the level of Foreman can participate in the scheme, but the higher levels are excluded from its scope. The following table gives the details of suggestions received in the last few years from the works employees and those that were accepted:—

Suggestion	1964	1965	1966
From *Executives*			
(*a*) Total	6	32	5
(*b*) Accepted	..	2	2
From *Non-Executives*			
(*a*) Total	16	26	6
(*b*) Accepted	1	.	1

16.14. It will be seen from the above that not many suggestions were received in the past and out of those received very few could be accepted. The fall in the number of suggestions during 1966 further shows that the participation of employees was poor in a most difficult year the Plant passed through. The administration of the scheme has not obviously been effective in inspiring and motivating the employees in giving worthwhile suggestions. That the will and atmosphere for creating an enthusiasm for making suggestions for improvement are by and large absent from the plant is also evident from the fact that when the General Manager, in response to a suggestion from the Committee, invited specific suggestions from all for improvement in process and technology, only five suggestions were received from the plant in all. It would not, however, be correct to imagine that either everything is all right there or that there is a dearth of able and creative minds in Durgapur. The Committee would like to emphasise that the suggestions from employees may not only bring improvements in specific areas or situations but will also mean growth of the individual employees' participation in management, encouragement of a creative atmosphere and above all high moral. Therefore the management should make a complete review of the scheme and analyse the causes for lack of its effectiveness. What is required is to encourage ideas and suggestions for improvement in all directions and faithfull implementation and adequate rewards on those which are found worthwhile. An atmosphere for this can also be created by encouraging formal seminars and informal consultations at all the levels of management.

16.15. Performance Control and Development is being done at the following four levels, for which a system of production reporting is already in existence:—

(i) **Departmental level.**

(ii) Works level.

(iii) General Manager's level.

(iv) Board's level.

The points to consider are (i) whether the information furnished at various levels is adequate and reaches timely, an (ii) how far the assessment and contribution made at each level are effective, and (iii) what may be done to have an effective system for improvements in working.

16.16. Performance control and development is of two kinds with reference to time:—

(i) The reviews and assessments made periodically as a routine, on a day-today basis, weekly basis, or monthly basis depending upon the level at which it is done, and

(ii) special reviews and assessments made from time to time for upgrading the performance. In case of a departmental head and the General Superintendent, the assessments have to be made every day and often on hourly basis, to ensure that the performance is close to the plan and the expectations, in terms of quality and quantity. At the GM's level the performance can be on day to day basis and at the Board's level it is normally to be done on monthly basis. Only more serious bottlenecks and deviations from the plans are noted at these levels as and when they occur. Such reviews are being done even now but the Committee feels that there is a scope for improving the effectiveness of the assessments made at the level of the G.S. and the Departmental Heads.

16.17. At all levels agencies must exist to determine the deviations and to find out the reasons therefor and to follow up, to ensure that the deviations are minimised. If problems and bottlenecks arise, such agencies could come into action and see that such bottlenecks are removed within the shortest possible time. For this purpose the Departmental Head has his own staff of operation and maintenance personnel to deal with the situations but it is necessary to provide proper agencies at the level of the General Superintendent. These will work as the watch-dogs of the General Superintendent and assist him in making realisation of the plans fully effective. The Committee recommends that a technical wing may be created to assist the General Superintendent in this regard. The wing should consist of suitably qualified and experienced engineers, say 2 to start with, one for the iron making complex and the other for the steel complex. These men should get into action as soon as difficulties and bottlenecks arise and take such action as may be required and as may be authorised by the General Superintendent from time to time. In fact, in the opinion of the Committee, the positions of the Chief Superintendents (Operation) should cease to be an intermediary level between the major Departmental Heads and the General Superintendent and an equivalent position designated as Assistant General Superintendent may be created in the Technical Wing of the General Superintendent to handle such problems alongwith the inter departmental coordination work entrusted to this functionary. The Technical Wing when it is free from routine work assigned to it, will also find time to devote to improvements in efficiency of the plants, *i.e.* for reducing the inputs of materials, improving and enhancing labour and equipment utilisation and finally reducing costs. The Technical Wing will work in close liaison with the Departments of Production & Control, Industrial Engineering and Research & Control, and obtain assistance as required from them.

16.18. At the GM's level, the departments of Industrial Engineering & Research and Control would, no doubt, perform the improvement functions allotted to them and will also render service to other departments in their respective areas of working. It is considered that the G.M. will not need any other special wing to assist him in establishing technical discipline or better technical control over the plant operation and maintenance which should be the sole responsibility of the General Superintendent.

16.19. The performance control and development at the Board's level should naturally take a wider but quite a deep look in the various aspects of the plant performance. The periodical reviews and controls will continue to be done by the Head Office as at present. In addition, however, it would be most desirable to create in the Headquarters, half a dozen posts of specialists at the very senior level, say of the level of the Chief Superintendents of the plants, who should be real experts in the different aspects of iron and steel technology. These men will form the nucleus for the assessment of efficiency and its improvement in all the plants within HSL, on a sectional basis.

16.20. The Committee has also considered other steps that could be taken for increasing the efficiency of Plant performance. Apart from the more active role that they have suggested should be played by the various departments of the Steel Plant, the Committee considers that it would be a very wise step to have an assessment of the performance made of every unit of the Plant by small Expert Committees which shall assess deficiencies, the hold ups, bottlenecks etc., big or small, whether of a temporary or a permanent nature and whether caused by any fault in design, layout, equipment, personnel or any other reason and indicate how they can be rectified with minimum expenditure. Similarly they will examine in detail the position and supplies of raw materials, operating methods, processes, and techniques and the role of the services in giving the required support. They will thus examine the performance and productivity of the units in all details and give their recommendations. The Committee suggests that this work should be undertaken in a systematic manner, department by department, by a team consisting of a Technical Officer from the Headquarters as the Convenor, the other members being a high level representative of the Superintendent of the Department, a high level representative of the Industrial Engineering Department and a Cost Accountant. One of the members should be spared on a whole-time basis and with the assistance of a very small Secretariat, it should be possible for the Committee to make a detailed examination of each unit and submit its recommendations within 3 months for big sections and 2 months for the smaller ones. Such a scrutiny must be conducted simultaneously in the other 2 HSL Plants also in the same units and with the same Headquarters Officer as Convenor, to ensure uniformity of approach and coordination in the details of the work involved and the pooling of the results. The Committee visualises more than one such team working in each plant since except for the one Officer to be placed in-charge, others will be only serving on part time basis in addition to their regular duties. At present, there are only a few such Officers in the HSL Headquarters at Ranchi at lower levels but as indicated in para 16.19. some more posts at higher levels will have to be created.

16.21. The performance control and development will not be complete without physical inspection of each section of the Plant by officials higher up in the heirarchy than the departmental heads because although on paper the performance figures may appear quite attractive sometimes, one may find that high production is either being attained by driving plants unduly or the operating practices are such that the plant would lose substantially of its working life. A regular round of inspections should, therefore, be made at the G.S.'s level, G.M.'s level and the Board's level. It may not be wise to laydown any definite schedules and programmes but the higher the person in the hierarchy the less is the frequency but the more the thoroughness of the inspection. It should, however, be borne in mind that too many inspections tend to create a touch of similarity which is neither good for the inspector nor for those who are being inspected. It should also be apparent to the Plants that the objective of visits to the Plants from the Head-quarter is not to find fault but to assist them in the attainment of higher and better levels of performance by understanding their difficulties and rendering them the required assistance.

16.22. As emphasised elsewhere, every executive must also concern himself with planning for improvement of his Section/Unit or Department. For this purpose, it is suggested that each Department must prepare its own development plans for the following year well in advance which should be submitted to the higher authorities for approval. The Committee suggests the creation of a Development Council with the General Manager as the Chairman, the Chief Industrial Engineer and some key top officials as its Members to consider the departmental development plans and dovetail them into a Plant Development Plan. The Chief Industrial Engineer should work as Secretary to the Council and the Technical Assistants attached to different Departmental heads should work as Coordinators for the departmental plans.

16.23. The suggestions made in this chapter have covered wide fields but the Committee feels that the proposals made are workable and will not involve large expenditure or any additional strain on the Plant. Once the schemes are launched and get under way, the benefits to the Plants will be substantial.

5 M of SM&M—8.

CHAPTER XVII

PERSONNEL MANAGEMENT AND INDUSTRIAL RELATIONS

17.1. The Personnel Manager who reports to the General Manager looks after the functions of Manpower Planning, Recruitment, Establishment matters, Industrial Relations, Vigilance and Security and Welfare within the Works. Recruitment of non-executive Trainees, is however done by the Training Department. The main objects of the Personnel Management are to ensure timely availability to the Plant of the employees of right calibre and attitudes, assist the management in their development and to help maintain contentment, discipline and balanced attitudes in the whole organisation. The effectiveness of the organisation at Durgapur can, therefore, be judged with reference to the fulfilment of these objects.

17.02. Originally in the Coates' Mission Report general indications had been given about the requirement of personnel based on the standards in U.K. and the number indicated was 9,800. This did not include several departments and was not apparently based upon any detailed studies. The estimates made by HSL in what is called the "Red Books" placed the requirements at about 7,700 but this exercise also had not covered all the Departments. Later the Head Office of HSL set up a manning Schedule of 8784 personnel for a few departments of the works. However, while this work was only partly completed, enhanced powers were delegated to the General Manager in 1963, who made his own decisions thereafter.

17.03. The Manpower Cell under the Personnel Manager looks into the manning requirements initiated by the departmental heads. The assessment is done on a broad basis and after a through scrutiny of each case sanction is given by the General Manager himself. It may be noted that no work-study techniques have been or are being used in order to determine the requirements of manpower. The help of Industrial Engineering Department is, however, taken in some cases.

17.04. Since the assessment of manpower has at no stage been done on the basis of scientific work-study, the quantum of surplus manpower employed by the steel plants has been a subject of controversy in the past. Durgapur, however, carried the minimum manning at the 1 million tonne stage as compared to the other steel plants. A detailed analysis of the manning for various departments shows that by and large the manpower in the Operation departments has been contained to the level originally envisaged by the Head Office. Increases are seen in the manpower required by the Maintenance Departments. Certain studies conducted in the past indicate that the surplus manning would exist mostly in the categories of unskilled and clerical personnel and the differences at other levels may be only marginal. The excess provision in the unskilled and semi-skilled categories is also partly due to the traditions in Indian industries of employing helpers and unskilled workers to assist skilled workers.

17.05. The Committee shares the belief that besides adding to costs and inefficiency, there is no greater headache to a plant than to carry unnecessary or surplus men. The Committee would, therefore, suggest that work study should be undertaken in a big way in order to determine the requirements of the manpower in the steel plant on a sound basis. The committee is also of the opinion that the function of manpower planning is a technical function involving intimate knowledge of the equipments and technology used and, therefore, this is better done by the Industrial Engineering Department instead of by the Personnel Department. The manning requirements can be finalised at the Plant level after mutual consultations between the Head of the Department concerned, the Chief Industrial Engineer, the Personnel Manager and the Financial Advisor. The proposal could then be sent to Head Office for a review. The Committee is of the view that larger benefits would accrue if the work of manpower planning done by the different plants is coordinated centrally and the central agency finally decides the manning at all levels on a rational and comparable basis. The Committee is not quite satisfied that Manpower Planning for 1.6 million tonne stage of the plant, recruitment, training and placement actions, have been taken in time to ensure that the plant is adequately manned as the units are commissioned

17.06. The Committee would like to make a special mention of the recruitment to the cadres of Graduate Engineers and the Graduate Officers for manning the managerial posts. According to the existing rules relating to recruitment and promotions to the executive posts, not less than 50 per cent of the vacancies in the grade of Rs. 400—950, occurring during a calendar year, are to be filled by direct recruitment, the remaining vacancies are being reserved for promotion from lower grades. The Committee regrets to note that the ration of direct recuits to the promotees to the grade of Rs. 400—950 was only 1:4 during the years 63-64 and 64-65 as against the prescribed 1:1. This was caused because, for unexplained reasons, Durgapur took only 8 Graduate Engineers each during 1963-64 and 1964-65 and only 9 Graduate Officers uptil 1965-66. It is also found that the intake of Graduate Engineers was suddenly raised to 162 Nos. during 1965-66. It is obvious that such fluctuations not only affect the load of the Training Department but also dilute the quality of personnel and create serious problems later in dealing with the large numbers of men of similar age groups. The Committee hopes that future recruitment policy would be such as would restore the imbalance created in the Plant between the direct recruits and those promoted from the ranks, in both the cadres of Graduate Engineers and Graduate Officers.

17.07. A few aspects of the promotion policy in Durgapur specially deserve mention:

(i) so far no systematic procedure appears to have been laid down by Durgapur for promotion of the non-executives from one grade to another. A systematic and fair procedure, known to all concerned, goes a long way in fostering healthy industrial relations. It is understood that the draft rules in this regard have been recently prepared. The Committee would emphasise that these rules be finalised without delay and duly publicised in the works and offices. Trade Tests should also be prescribed fully wherever these form the basis for promotion.

(ii) The Committee is glad to note that HSL, in consultation with the Plants, are finalising rules for promotion of non-executives to the scale of Rs. 400—950 p.m. on the basis of written tests, post-selection training and examination after training. This step will surely help to build-up an efficient executive cadre.

(iii) HSL rules for promotions within executive cadre lay down the qualifications and experience needed in each grade before promotion to the next higher one. It lays down a qualifying period of 3 years for promotions upto the grade of Rs. 1600—2000 and a period of 4 years for promotion to the scale of Rs. 2000—2250. Presumably the intention was to make the speed of promotions at higher levels slower. With the decentralisation of authority in HSL, however, no time limit was prescribed. The Committee has observed that the promotions in the executive cadre have been too rapid in many cases, resulting in executives occupying higher positions before maturing for them. This not only affects the quality of performance but also creates a positive dis-incentive in the minds of those supervised. The Committee understands that steps are already afoot to reintroduce the concept of qualifying periods.

(iv) Constitution of promotion Committees at the Plant level has also been laid down in the rules. Instances have been brought to the notice of the Committee where the Promotion Committees were not constituted in the manner envisaged in the rules. The level of the Members of the Promotion Committees is an important factor in inspiring confidence in the minds of those who are being considered and, therefore, as far as possible the levels of the members should not be scaled down.

(v) The present rules for promotion from one executive position to another are quite sound. However, frustration exists in the minds of many junior executives regarding the basis of determining merit. The Committee considered the situation carefully and is of the view that once having selected bright and technically well qualified persons on an All-India basis, the responsibility for their development should also lie on the Management, and if this function is efficiently carried out supersessions in the junior ranks at least could be greatly reduced.

(vi) In order to make the promotion policy effective, it would be essential to lay down the channels of promotion, the object being that, as far as practicable, every one in the organisation should be on a channel to enable him to reach to the highest level, provided he possesses the necessary qualifications and experience needed at various levels and no one should get an undue advantage due to being placed in a particular position. For this purpose, the line of promotion need not follow the relationship defined on the Organisational Chart, but departments performing similar functions whether inside or outside the works may be grouped together for the purpose of determining the channels. The channels having been defined should be also made known widely in the Plant.

17.08. The effort on training has to be directed into the following directions, i.e.:

(i) Initial training after recruitment.

(ii) Employee's training to make the employee concerned do his own job better and to prepare him for higher jobs.

(iii) Training after promotion to the next higher post.

17.09. The Technical Institute is undertaking initial training of various kinds of apprentices but the effort spent on employees' training and management and supervisory development has to be further intensified because most of the executives appeared dissatisfied with the competence and performance of their non-executive personnel. It may not be possible, however, to take in hand this work immediately for all the non-executive personnel on account of large numbers, but the areas where skills are most lacking should be located by the management e.g. the Wheel and Axle Plant and training programmes arranged in order to meet the deficiencies on a priority basis rather than providing training of standard types.

17.10. In the opinion of the Committee the Training Department has not progressed fast enough in keeping with the Training needs of the Plant. In order that training function covers all the departments of the Steel Plant and since training is at best a personnel function, the Committee recommends that the Training Department be temporarily strengthened according to present requirements and be placed under the Personnel Manager.

17.11. A study of the number of executives who joined DSP on direct recruitment till 1965-66 and those left the Plant during the same period brings out the following:—

Executives in	Total no. joined	Total no. left	% Total no. left of those joined
Works Deptts. . .	865	122	14%
Non-works Deptts. .	201	72	36%
Total Executives .	1066	194	18%

Another 45 executives left the Plant during the first 8 months of 1966-67. The above shows a very high percentage of executives leaving DSP. It is also noted that the flight of works executives started in a big way from 1963-64 at the rate of above 30 per year which perhaps shows that many engineers left the Plant as soon as their contracts with HSL were over. The Committee was informed that one of the main reasons for executives leaving DSP was the availability of better avenues of employment outside. The Committee views this matter with great concern specially in the context of a very expanding steel industry and would suggest a detailed investigation into it by the HSL authorities.

17.12. Industrial relations at Durgapur have not been very happy but the Committee has not made a study of these. However the period between 5th and 13th August 1966 witnessed the worst phase and plant operation came to almost a stop. These disturbances accounted for a production loss of 28,000 tonnes of finished steel and other products valued at Rs. 1·35 crores. It may also have caused some damage to equipments in departments like coke ovens. The employees lost their wages for the entire period. The morale of the officers was very much shaken because of the state of vandalism prevailing in the township during those days.

17.13. There could be several reasons for the state of industrial relations at Durgapur including a few lapses here and there on the part of the management, but the main source of trouble seems to be the interest and participation of the political parties in wooing the respective unions for pushing their own party interests. It is to be considered very seriously whether the

Plant in which Rs. 275 crores have already been invested and a further investment of more than Rs. 350 crores to double its capacity is contemplated and which if properly and profitably worked will bring great prosperity all round, could be allowed to suffer on this account.

17.14. The absenteeism in the Works (excluding off-days) has been about 15·2% during 1966-67 as compared to 13% during 1964-65| 1965-66 and 12% during 1963-64. Since the leave facilities in the Plant are very liberal, absenteeism to the extent of 14·5% has been taken as authorised absenteeism. However, keeping in mind that the absenteeism in DSP is about 1½ times as compared to another plant of Hindustan Steel and the Production Incentive Scheme already in existence should act as deterrent to absenteeism, this absenteeism cannot but be considered high. Absenteeism in Durgapur also appears to have been regulated in a way by the staff themselves with reference to the overtime earnings and even though a worker may lose bonus when he is absent, he would more than make up the loss by working on overtime. A recent check on overtime payment has been effective in reducing the payments but has naturally caused dis-satisfaction amongst the workers. A detailed study into the causes of absenteeism might improve this aspect.

17.15. A three stage grievance procedure is in existence in Durgapur Steel Plant and has been regarded by the Plant as working quite satisfactorily. Many of the executives however told the Committee that the Labour Boards and Labour Committees were not serving the purpose for which they were meant and were being used sometimes to vilify the superior staff. It would, therefore, be advisable to study the extent to which these bodies are effective and how the handling of grievances could be made more efficient.

17.16. Certain statutory welfare activities like canteens, public conveniences, buildings and safety measures have already been provided. Although public conveniences exist in adequate numbers, the Committee found that in some cases they were not properly maintained. Regarding safety and accident prevention work, the Committee noted from the following figures that accident rates have gradually declined in Durgapur Steel Plant which is very commendable.

Item	1963	1964	1965	1966
		3·3	1·9	1·3
Rate/1000 workers	179	96	56	3·1
		37	767	491

Durgapur has also been the recipient of the National Safety award—1966 for highest percentage reduction in frequency rate, and also for longest accident free period—unfortunately four fatal accidents took place in January/February, 1967 owing to an explosion in the Coke Oven Gas main.

17.17. Judging by the contribution made by the Personnel Department in the attainments of the objects for which the Department exists and the opinions expressed by several executives, the Committee feels that the personnel functioning of DSP has not been as effective as it should have been. The two main contributory factors in this regard are given below:

(i) Many of the officers in the Personnel Department do not possess the requisite background required for Personnel Management. Besides in many cases promotions have been quite rapid. This has affected the quality of persons administering the personnel functions. The management should consider whether some of the officers in this department should not be transferred with advantage to some other departments of the plant and in their place specially trained officers recruited and developed.

(ii) The Personnel Managers at Durgapur have been men drawn from the State services and have been returning to their parent departments after the completion of their deputation periods. They must necessarily take some time to get set and the experience gained by them at the cost of the Plant is a total loss to the undertaking and perhaps it also gives no special advantage in the positions to which they return. The Committee believes that the Personnel management is a specialised function and, therefore, the men who have qualified and are committed to this profession should only be brought in to head the department as also to man the various posts. It also appears sonnel Manager should be raised and made at par with F.A. & C.A.O. and other members of the Top Management Team.

17.18. The Committee would suggest that all the rules and procedures in the field of Personnel Management should be codified as soon as possible and an Establishment Manual printed and copies thereof made available to all the employees to the extent required. The Committee is glad to know that the Head Office has already taken action for codification of rules and procedures on HSL basis and the manual is to be published shortly. This will however have to be supplemented at the Plant level.

CHAPTER XVIII

INCENTIVE SCHEMES

18.01. The purpose of providing incentives is to obtain the willing cooperation of the employees in the fulfilment of the tasks assigned to them or expected of them and to create an urge in them to perform the function better. Incentives may, therefore, be of the following types :—

(i) Financial incentives—such as wages, production bonuses, provident fund, gratuity, attendance bonus, profit sharing bonus, other bonuses, cash awards, etc.

(ii) Non-Financial incentives—such as facilities and amenities for housing, welfare, education, medical treatment recognition, consultation etc.

18.02. Incentive schemes also known generally as system of payment by results form one of the main planks on which modern industrial management stands today. If properly conceived and properly timed they should produce maximum results by way of higher production for the industry and bigger pay packets for the workers. As against these benefits there could also be several short-comings and difficulties like deterioration in the quality of products, a harsher flogging of the plant and equipment, accidents and health hazards and an increased staff force to administer the schemes. It is understood that in the U.S.A. some companies are abandoning this system in the belief that by giving higher basic wages and with a dynamic, efficient and agressive management, it should be possible to obtain much higher levels of productivity and efficiency in the organisation. In India, on the other hand, some organisations believe in low wages and high payments by way of incentives so that the staff work harder and produce more thereby.

18.03. In the HSL the original scheme known as the 'Bonus Scheme' was introduced on company-wide basis from December, 1961 when most of the production units of Bhilai and Rourkela and some of the units in Durgapur had been commissioned. The aim of this scheme was to improve production in the Plants and also to bring the earnings of the workers at a level comparable to the Private Sector Steel Plants. The revised Production Incentive Scheme which is currently applicable at the Durgapur Steel Plant came into effect from March 1964. The main features of the present scheme are that entitled employees have been classified into four groups i.e., Production, Maintenance, Services and General Groups. Their relative incentive rates have been given as 100 per cent, 90 per cent, 90 per cent and 50 per cent respectively. Within a group, however, these incentive rates again vary from 100 per cent to 50 per cent according to their scales of pay. It is also provided that the bonus should be reckoned on the basis of such production as comes up to the specifications laid down. Some concessions have been allowed here and there and some weightage factors have also been provided, for example allowing additional weightage for rolling sections which consume more time.

18.04. Some of the short-comings are that bonus payment has been regulated in accordance with the production and not always on the quality. In many cases the performance of one section has been linked with another or to the performance of another Department or of the Plant as a whole. The scheme also covers employees only upto the level of General Foreman (Grade Rs. 1100—1400) in the Works Department but personnel in the non-works department are completely excluded from its scope. One of the problems in the administration of the scheme has been that due to changes in market conditions which is not a factor within the control of the management or the workers the targets for the incentive bonus had to be lowered. The repercussion of the original bonus scheme for the Coke Ovens based on the number of ovens pushed which lead to malpractices has already been dealt with in Chapter VI.

18.05. The initial aim of raising the output and the earnings and for building up morale, when detailed performance data was not available, has been, by and large, fulfilled. However, most of the executives at Durgapur, in their replies to the questionnaire of the Committee, as also during the personal discussions held with them, expressed the opinion that these existing schemes should be revised on a more scientific basis relating it more directly to group efforts and also making due allowances for quality. With regard to coverage, many felt that all levels of all departments should be brought under the scope of the incentive schemes. In the light of the discussions held and the studies made by it the Committee believes that all categories of staff should participate in the incentive scheme with different bases for the evaluation of their performance and with different but adequate levels of incentive payments. The Management should, therefore, rationalise the scheme on individual or interdependent group basis, after work-studies have been conducted by the Industrial Engineering Staff to the necessary extent. Changes in materials, processes, equipments etc., after 5 to 7 years of plant operation and the changes in the offing due to the expansion of various units would also call for a complete review and revision of the scheme on scientific lines. This, therefore, appears to be the most opportune moment for introduction of a more rational scheme. It would also be desirable to have a process and technological audit later on, once every year, to determine the deviations in practice and to plan for necessary revisions in the scheme on a deliberate and continuous basis.

18.06. According to the present procedure, the production data for each department is collected by the office of the General Superintendent, and the percentage bonus entitlement worked out and intimated to the Accounts Department. The Committee feels that it would be better if the calculations are made instead by the Industrial Engineering Department based upon the production reports made out by the Inspecting agency indicating production qualifying for incentive bonus. It will be necessary to lay down detailed instructions regarding production reporting, computation and communication of bonus figures and finally test checks by the Internal Audit Section.

18.07. The Committee was informed that the Management of HSL had considered a proposal in 1965 for incentive performance bonus for higher executive personnel in the Plants in the Grades of Rs. 1300—1600 and above. The performance factors consisted of the quantity of out-put quality, cost reduction, housekeeping, industrial relations etc., with varying degrees assigned to each factor. The HSL Management, however, considered it prudent not to cover the management personnel by production bonus schemes but decided to consider instead a revision of the scales of pay with reference to enhanced responsibilities. The Committee, however, recommends that the matter may be reviewed again and all the executive and the non-works staff should be brought into the scheme.

CHAPTER XIX

FINANCIAL MANAGEMENT & COST CONTROL AND SALES

19.01. The Committee would like to state that in this chapter it will like to deal with only those few aspects of financial management, cost control and sales that have a bearing on the efficiency and profitability of the Plant.

19.02. **Operational budget:** The procedure for the preparation of the Operational Budget of the Plant is that the original budget pertaining to a financial year is prepared by September/October of the preceding year. It is revised in September/October of the financial year to which it relates, on the basis of the actuals for the half year and the trends of expenditure. The departmental budgets are checked and consolidated by the FA & CAO, after which the total budget is scrutinized and approved by the General Manager and finally forwarded to the Head-quarters for obtaining necessary sanctions from the Board. At present, efforts are made to exercise budgetary control though periodical expenditure statements with reviews thereof.

19.03. The Committee found that although the routine prescribed for the preparation of budgets is being observed, the significance of budgets as a means of controlling expenditure in relation to income or necessity to find sources of income in relation to expenditure visualised, has not yet been fully appreciated by the Plant Management. Further when incomes expected in the budgets do not materialise, rigidities tend to take place in respect of many essential items of expenditure. The budgets are being used primarily for obtaining fund authorisations and thus, the operational budget as an effective instrument for profit planning and control has not yet established itself. The table at Annexure XIX-A indicates the deviations between the actual performance and the provisions made in the budgets.

19.04. A detailed comparison of the approved budget with actual performance during the last two years shows that against certain items variations have been as high as 20 per cent to 30 per cent over the approved budget. Such variations in the opinion of the Committee, are unduly large and the Committee feels that with the knowledge and experience gained so far, on the operation of the plant and in the preparation of the bulgets, it should be possible for the plant to prepare more realistic budgets. The budget must be taken as a living document for profit planning and cannot be merely need based. Therefore, in the normal manner the process of budgetting must start from the sales forecast and all other budgets should flow from this sales budget culminating in planning action in various areas for the achievement of the profit objective.

19.05. (a) **The extent of losses** (i) losses incurred on stores, tools, equipments and plants as disclosed in stock verification, and (ii) due to thefts are given below:

(Amount in '000 of Rs.)

	1963-64	1964-65	1965-66
A. *Stock verification*			
Stores			
(i) Surpluses (amount)	63	317	104
(ii) Deficiencies (amount)	19	210	23
Refractories			
(i) Surplus (amount)	2,627	1,028	315
(ii) Deficiencies (amount)	3,143	1,013	626
B. *Theft cases*			
(i) No. . .	124	137	157
(ii) Amount . .	99	121	291
Other than theft			
(i) No. . .	44	94	10
(ii) Amount . .	62	124	60

(b) Shortages/surpluses in respect of raw materials were as follows:—

(Amount in '000 of Rs.)

	1963-64	1964-65	1965-66
Shortages	2916	3254	6135
Surpluses	2118	478	100
Shortages due to underloading	792	10	..

(c) Shortges/surpluses in respect of finished/semi-finished products were as follows:—

(Amount in '000 of Rs.)

	1963-64	1964-65	1965-66
Shortages	3,133	12,966	8,309
Surpluses	1,249	2,029	6,153
Shortages due to Export	1	..	..
Surpluses due to Export	30	..	..

19.06. While necessary efforts are being made by the management to reduce the quantum of losses as far as possible, the Committee would like to make a special mention of the losses due to thefts. Almost everyone with whom the Committee discussed the question of losses, mentioned that the working of the plant was getting affected owing to thefts of vital parts of equipment and instruments, which are on the increase day-by-day. This is borne out by the trend of losses due to thefts. The reported figures are not very large but the resultant losses are estimated to be much higher. Thefts are also quite common in the township. The management is quite aware of the incidence of thefts and is tightening the security measures in order to minimise losses on this account. The Committee would suggest that one of the measures that could be taken to prevent recurrence of thefts with such vexatious frequency would be to summarily dismiss an employee once the theft is proved whatever be the amount involved. The Plant should also provide for surprise visits by senior members of management during night shifts.

19.07. **Cost Control :** In their report published a few months back, the Committee on Cost reduction of Steel headed by Dr. Hare Krushna Mahatab have examined in depth the various factors contributing to increases in cost of steel and have indicated how these factors may be controlled and savings in cost effected. The Mahatab Committee have covered, *inter alia,* the aspects relating to raw materials, fuel and power, plant operation, personnel costs and inventories. Action to implement the various recommendations of the Committee is, no doubt, under way by the agencies concerned at different levels. The Committee would, however, like to emphasise certain areas where the Steel Plant management could focus its attention for achieving cost reduction. The following tables summarise the trend of costs :

(Rs. in lakhs.)

Cost of	63-64	64-65	65-66	1966-67		
				I Qr.	I Qr.	III Qr.
1	2	3	4	5	6	7
Raw Material	1903	1912	2077	436	368	373
Stores & Spares	606	593	574	138	114	142
Salaries & Allow.	462	543	691	173	172	186
Overtime	54	75	106	30	13	12
Total cost of production incl. Balance items.	5886	6268	6874	1623	1462	1679
Total Maint. Cost	476	562	609	132	115	120
Value of Inventories :—						
(*a*) Finished & Semi-finished	550	774	1092	1104	1116	1061
(*b*) Raw Materials	169	135	171	198	154	119

19·08 Works Cost of Services :

(in Rs.)

Item	63-64	64-65	65-66 :	1966-67 I Qr.	1966-67 II Qr.	1966-67 III Qr.
1	2	3	4	5	6	7
Raw water per 10^3 M^3	50	44	51	47	47	53
Processed water per 10^3 M^3.	110	123	132	140	145	146
Steam per 10^3 M^3	7	7	8	N.A.	N.A.	N.A.
Power per 10^3 Kwh..	46	45	56	79	99	74
Oxygen per 10^3 M^3	130	130	169	159	165	184
Coke Oven Gas per 10^3 M^3.	36	35	37	39	42	40
Blast Furnace Gas per 10^3 M^3.	7	7	8	8	10	9

19.09. It may be mentioned that cost reduction is very closely linked with the efficiency of performance and, therefore, can be achieved by better performance and quality production. The scope for cost reduction exists everywhere but more generally in the following areas:—

(a) Consumption of raw materials, stores and spares including belts, rolls and refractories, and in the use of services.

(b) By exercising strict control on the quality of incoming materials.

(c) By improving the operating practices, thereby getting better quality of products and better yields.

(d) By proper attention to the re-use and profitable disposal of the rejects and scrap etc.

(e) By reducing inventories of finished and semi-finished steel and also of the raw materials stocks.

(f) Rationalising the working force by proper work studies and by cutting down the levels in the organisation as far as possible.

(g) A strict control on the overtime payments.

(h) By controlling the costs of providing amenities to the employees.

Some of these are dealt with in some detail in following paras.

19.10. **Overtime payments:** The expenditure on overtime payments made to the staff in the last few years will be seen from the following table :

Year	Amount of Overtime payment Rs. lakhs Works	Amount of Overtime payment Rs. lakhs Administration	Amount of Overtime payment Rs. lakhs Total
1963-64	38·85	15·28	54·13
1964-65	56·93	18·30	74·73
1965-66	83·08	23·86	106·94
1966-67	60·00	7·50	67·50

It would be seen that there has been 100 per cent increase in the amount of overtime paid to employees during 1965-66 as compared to 1963-64. Assuming an average salary of Rs. 3,000 per employee per year, the amount of overtime paid in 1965-66 would have enabled employment of a regular additional working force of about 3,500 men throughout the whole year. The Committee is glad to note that the amount of overtime has been substantially reduced during 1966-67 and all efforts are being made by the Management to reduce it further. The Committee hopes that the reduced expenditure of overtime has not been a function of lower performance of the plant during 1966-67 and when the plant reaches normal output levels, the overtime payments will not only be allowed to rise but will be reduced as compared to the payments made in 1966-67. The Committee believes that an effective system for acting from lower levels will make a lot of difference in overtime payments to take care of high absenteeism.

19.11. **Amenities and conveniences provided to employees:** The various kinds of amenities and conveniences provided to the employees as also the subsidy/deficit per employee are indicated in the following table:

(Figures in Rs.)

Item	1963-64	1964-65	1965-66
Free/subsidized education	43	51	66
Subsidized housing .	39	52	46
Free Medical treatment	134	165	180
Subsidized transport .	255	184	225
Others			
Amenity grants, L.T.C. Subsidy on Canteen . Coal Subsidies .	NA	53	100
TOTAL . . .	..	506	617

Besides the above, liberal assistance to an Employees' Cooperative Society is also given in the shape of loans, rent free accommodation and provision of staff and Officers of some categories. Contributory Provident Fund and Gratuity Scheme are also in operation. It was not possible to make an assessment of the subsidy separately for executive and non-executive personnel as no separate accounts are kept.

19.12. The Committee would like to state categorically that it is in favour of all useful welfare measures which add to the contentment of the Staff. However it will be seen from the above that the subsidy/deficit is more than Rs. 50/- per employee per month, which is a high figure. The Committee would like to emphasise that there is scope for great economy in the expenditure incurred on the various amenities, the cost of which has been rising fast. Every one therefore connected with their administration should work for economy and prevention of waste. There are two areas where studies may have to be made to find out if the expenditure in providing these amenities could be reduced without diluting the nature of service rendered to the employees. The medical department expenditure is one area, and another is the provision of subsidies for transport to the employees. The Committee understands that a few top officers have been allotted Company's cars on the payment of the usual sum of Rs. 175/- per month but the expenditure incurred per month per car comes to about Rs. 1,300/- per Officer. The Committee is of the view that except for the General Manager, no other Officer should be allotted a Company car and instead the car allowance may be paid on a more liberal scale to them. As regards transport for the employees this is one factor where failure at any time may paralyse the working of the entire steel plant because all the employees residing in the township are supposed to be conveyed to the Plant in the Company's buses. There are, however, quite a large percentage of employees who do not stay in the township and have longer distances to cover, find their own way to reach the Works and even out of those residing in the township, many use their own conveyances. The Committee is of the view that since in any case the Plant transport does not carry all the employees of the Steel Plant to the Works a scheme should be evolved to grant adequate conveyance allowances (cycles, scooter, etc.) to all the employees and withdraw the bus services gradually. The location of the township to as near the Works as possible is another factor which could have reduced dependence on an organised transport system and the Committee is glad to note that the future growth of township is being planned in the sectors nearer to the Works.

19.13. The Committee would like to mention that Durgapur Steel Plant had constituted a Cost Reduction Committee, which has made very useful recommendations regarding the quality of materials at different stages, reduction of usage rates, improving production and controlling costs. The Committee would suggest that a Permanent Standing Committee for cost reduction may be formed immdiately at the Steel Plant with the proposed Assistant General Superintendent attached to the G. S. Office to be put specially incharge of it. The Committee should consist of the representatives of the Cost Branch, Industrial Engineering, and the Department concerned and should cover one by one all the departments of the Steel Plant. To be more effective, however, the following action would also be required, bearing in mind that cost control is the business of every one working in the organisation.

19.14(i) Cost data should be made available at all the levels of management including the Assistant Foremen. Quantitative data on consumption, production, quality etc., most of which is readily available, should be fed back to the operating levels. The cost data supplied to various levels should be adequate in content and should be supplied timely. This would naturally vary depending on the level of the management. The Committee noted that monthly cost meetings are held at Durgapur at the GM's level but the meetings at the level of the Superintendents for controlling costs have been started only recently. It would be necessary to make these meetings at shop floor effective and useful for which a suitable system should be laid down so that the cost data is available to the supervisors in the manner that they can understand and make use of.

19.14 (ii) The Committee feels that the stage has now come to introduce standard costing in the Plant based on optimum capacity production and efficient operation of the various plant units, even though information available may appear inadequate in the beginning. These costs can be made more realistic with experience.

19.14 (iii) Building up of an attitude at all levels including the workers that it is only by optimum utilisation of resources, cutting down losses and wastage of all kinds, and by reducing costs that the industry can survive and prosper in which also lies their own prosperity.

19.15. **Sales Problems**—It is axiomatic in the matter of ensuring high productivity in any industrial undertaking that, apart from the efficiency in production, the pricing of the products and efficient marketing must play an important part. The Committee has not gone into the question of pricing of the products because this is a matter over which the Steel Plant, in a way, has no control. The Committee has also little to comment on the working of the Central Sales Organisation based at Calcutta with branches and stockyards established at various strategic parts in the country. Still it would be a relevant question to ask as why the HSL Plants cannot sell what they produce or why they should not produce what is saleable as the Private Sector Plants are in fact doing. However, certain observations may be made as a result of the discussions held with the Chief Sales Manager and his officers, the Joint Plant Committee, the Iron and Steel Controller and many big and small consumers.

19.16. The main comments made to the Committee in areas of production, planning and despatches were :—

(i) A wide variation was found between the programmes made out by JPC jointly in consultation with the Plant and the actual rolling by the Mills.

(ii) There is some reluctance to produce smaller sizes like 12 mm and 16 mm rounds according to targets jointly decided in the JPC meetings. This is because the price of these categories is not commensurate with the effort and time spent on them.

(iii) Some of the sections rolled were not found true to profile.

(iv) Only a part of the production at Durgapur was export-worthy, sometimes because of the quality and also because the required combinations were not available.

(v) Durgapur was rolling very large quantities of the same section at a time before proceeding to the rolling of other sections. In other words, large quantities of one section were rolled before another section was attempted. This results in an irregular flow of material to the stockists and consumers, who would like to have their demands of all sections met in regular and more frequent streams. Apparently also the market gets flooded with one type of material which produces a surplus of the particular section and an artifical scarcity of others and *vice versa*. This is not good for the health of the market.

19.17. The main customer complaints relate to the following areas:—

(i) Delays in receipt of railway documents by the party at destination resulting in payment of demurrage/wharfage by the party against such consignments.

(ii) Some of the customers also complained about the quality of materials, correct lengths and sizes, shortages in weights and wrong and defective materials supplied to them at destinations.

(iii) Some of the consumers said that complaints and claims referred to the Plant did not receive quick attention. The average number of outstanding claims every month during the last one year has been 248 of which on an average 48 (20 per cent) were stated to be pending with the Plant for more than 3 months. The recent trend in the settlement of claims has, however, been better but efforts must be made to dispose off claims within a period of 30 days at the most. The Management is also aware of the nature of these shortcomings and complaints and have to streamline their procedures for inspection and verification of claims and their quick settlement. There is every scope for improvement as sometimes the dictum that a customer cannot be wrong and has to be fully satisfied is not observed in practice. The Committee suggests that Superintendent (Production Planning) and the Chief Metallurgist should be given necessary authority and powers to consider the claims and dispose them off in consultation with the FA & CAO.

19.18. The percentage of off-grades production at the Mills during the period October 1966 to January 1967 has been of the order of 14.4 per cent for Blooming Mill, 18.2 per cent for Billet Mill, 26 per cent for Section Mill and 24.5 per cent for Merchant Mill products. The percentage of off-grade is much high as compared to another plant of HSL where it is only about 5 per cent. The off-grade production affects the sales realisation to the extent of Rs. 55/- per tonne and because of the price differential there is a tendency in the market to prefer off-grade materials which affects those plants where off-grade production is not as high.

19.19. The quality of products including reducing off-grade, rolling to correct section and supplying materials to length prescribed are factors which can be controlled by the operation personnel. A check on off-grade production is most essential for obvious reasons which will also help in reducing inventories. Tightening of inspection by the Research and Control Organisation would also be helpful in this regard. The problems regarding the shortages in weight supplied is one of stricter control at the loading points in mills. The Committee was informed that the vigilance Sub-Committee of the Plant has studied this difficulty in detail and has made certain recommendations which are under implementation by the Management.

19.20. Till recently steel was selling by itself, but the stage has come when customers' dissatisfaction can lead to a loss of market, the creation of which should now be one of the main objectives of the Plant. It is only to emphasise the obvious that the entire policy should always be, but it has become specially so now, that it is to be customer oriented. The emphasis has also to be on establishing and expanding the export market where the quality has to be given the maximum attention.

19.21. All these problems have been discussed with the Officers concerned in the Steel works. No doubt, they have their difficulties, but it has been impressed by the Committee that the rolling programmes have to be suitably adjusted to the demands and to ensure regular flow of the required sections. The production has also to be diversified at Durgapur to meet the market demands.

CHAPTER XX

PLANT REORGANISATION AND THE H. S. L.

20.01. The Committee has carefully studied the present set-up of the Durgapur Steel Plant and how it has grown through the years. The Committee feels that for the Plant to be able to undertake the short-term and long-term work of improving plant performance and productivity and to achieve within a reasonable period the rated capacity of 1·6 million tonnes, which should now be its target, some reorganisation and strengthening is required. The Committee will suggest that this matter may be examined by the plant and the HSL on a high priority basis.

20.02. On the operation side, the General Superintendent must naturally be regarded as the overall head of the set up. The Committee would like that his duties and responsibilities should be defined in some detail by the Plant as it is not enough to say that duties are known by convention and experience. This will apply to all other executive and non-executive Plant personnel. In many spheres, there have been failures, precisely because even the main duties have not been spelt out.

20.03. At present, the control of the General Superintendent on the Operation Superintendents is somewhat indirect in the sense that there are Chief Superintendents interposed between the General Superintendent and these Superintendents. The Chief Superintendent (C&I) has jurisdiction over the work of the Coke Oven and the Blast Furnace complexes and in addition he has the Foundry under him. The Chief Superintendent (SM&F) has control over the work of the Superintendent (SMS) and the Superintendents, Rolling Mills and the Wheel & Axle Plant. The Committee is of the opinion that the Superintendent of a major Plant should be the undisputed head of his department reporting directly to the General Superintendent. He should be really a very competent person possessing all the technical qualities required in a man incharge of the operation of the big department entrusted to his charge and, in addition, he should also have the other attributes that go to make a good manager. It certainly cramps the style of a keen person if somebody else is interposed between him and the General Superintendent and he is thereby excluded from some of the top level conferences where the important production problems which have a direct bearing on the performance of his department are discussed and decided upon.

20.04. In the early days of the public sector steel plants when there was serious shortage of experienced staff sometimes men not yet fully mature, had to be appointed to take charge of some departments, Chief Superintendents had been appointed over a group of departments with the definite object of providing technical guidance to such departmental heads. The position has considerably changed now and it is, therefore, the Committees view that the Superintendents of major departments should report directly to the General Superintendent. This cannot, however, apply in the case of the Rolling Mills, where a Chief Superintendent is definitely required to coordinate the activities and give the Superintendent and Managers technical guidance.

20.05. The Committee, therefore, recommends that the Superintendents of Coke Ovens, Blast Furnaces and Steel Melting Shop Departments should report directly to the General Superintendent. This should also be done in the case of the By-Products Department on account of its great importance and the imperative need to develop the production of this unit and for the same reason the post of the Assistant Superintendent in-charge of this Plant should be upgraded to that of a Superintendent and he should no longer be under the Coke Oven Superintendent. Further the post of the Chief Superintendent (Coke Ovens & Iron) should be abolished. The department of Steel Melting Shop will cease to be under the Chief Superintendent (Steel Making and Finishing) and placed directly under the General Superintendent. This Chief Superintendent may be redesignated as Chief Superintendent (Steel Finishing of Mills).

20.06. A very important duty of C.S. (C&I) and C.S. (SM&F) at present is the departmental coordination required within his individual charge as well as between their two charges. For this purpose, the Committee recommends that in lieu of the post of CS(C&I) to be given up, a post of Assistant General Superintendent may be created who will work directly under the General Superintendent and will be incharge of the proposed department of Production Planning & Control and will effect the necessary coordination between the Superintendents of the major Departments and the Chief Superintendent of the Mills. The Committee also feels that this will be a much better arrangement than the existing one in so far as coordination is concerned.

20.07. At present, the various Operation Superintendents of the departments are in the grade of Rs. 1600—2000. However, there is no rationale behind the same grade being given to the various Superintendents irrespective of the importance of their respective charges. At the 1·6 million tonne stage, the work of the Superintendents of Coke Ovens, Blast Furnaces, Steel Melting Shop will be considerably increased and it is but fair that they should be put in the same grade as the present Chief Superintendents, *viz.*, Rs. 2000—2250, provided the persons are fit for this promotion. However, paying different scales to the Superintendents according to their duties, responsibilities and performance should become a normal feature. There may thus be Superintendents in either of the two grades, Gr. I being the scale of Rs. 2000—2250 and Gr. II, Rs. 1600—2000. These three Superintendents (C.O., B.F., & S.M.S.) have an Assistant Superintendent for day duty only. The Committee is not sure if there is justification at present to give to these three Superintendents two more Assisant Superintendents so that there will be one Assistant Superintendent in all the three shifts. This may be examined at the appropriate level.

20.08. The Committee is constrained to remark that the Commercial Manager has not been assigned the functions that had been envisaged for him in 1963. It is rather incongruous that the garage should be put under the Commercial Manager at Durgapur and that he should have no say in production planning. In the opinion of the Committee, the garage should be placed under the Township Organisation as is the case in some other plants and further the duties of the Commercial Manager should be re-examined.

20.09. Coming to the management of the township, it had been laid down in 1963 that a Township Council should be established for managing its affairs. This has not been done at Durgapur. The township is under the charge of an Officer in the Grade of Rs. 2000—2250 who is called an Officer-on-Special Duty (OSD). This is a very odd designation and should be rectified and an Advisory Council should be established to assist him in the sphere of the Welfare activities of the Township. The charge of the garage may also with advantage be given to the Township Administrator and the Public Relations Officer transferred to the General Manager's Organisation, say under the Commercial Manager.

20.10. In Chapter XVI, the Committee has underlined the necessity of increasing the utility of the Industrial Engineering, and the Research and Control Departments, strengthening and reorganising them and placing them directly under the General Manager. The Committee would like to recommend that a post of a Coordination Manager in the same grade as the Personnel or Commercial Manager be created to coordinate the working of these departments and any other departments that may be placed under him by the General Manager like the Security and Public Relations.

20.11. The Committee understands that the HSL is setting up a high level Research Organisation at Ranchi for undertaking research in problems confronting the steel industry, more especially the problems that affect the HSL plants and to coordinate research and serve as a clearing house for the dissemination of new developments. In this connection the Committee is of the opinion that Durgapur Steel Plant should actively associate itself with Central Mechanical Engineering Research Institute. It is understood that one of the main reasons for locating the C.M.E.R.I. at Durgapur was the presence of the Durgapur Steel Plant there. However, it is found that the association between the two is very meagre at present. There are many fields in which such association can take place with mutual advantage. The C.M.E.R.I. are specialising in economical design of structures and savings can be effected by designing new structures in consultation with them. The C.M.E.R.I. has also a well developed Instrumentation Section in which field the two organisations could make an immediate mark, in not only on substitution of imported instrument by indigenously produced ones, but also new and improved instrumentation for speeding up work and reducing costs could be developed. Another sphere where the Engineers of the two Organisations could work together is in the sphere of maintenance by welding. Even a more important sphere would be in the rationalisation, manufacture and import substitution of major and special types of spares required for the maintenance of the various units of the steel plant. These objectives would be furthered by forming composite teams of HSL and CMERI designers, engineers and metallurgists.

20.12. The Committee was disappointed in noting that there was very little association and pooling of knowledge and experience between the 3 HSL Plants. It was the policy of HSL, in earlier days, to encourage not only frequent meetings of the General Managers, which is still being done, but also to encourage the Plant level officers to meet frequently in different plants to benefit by the experience of the other plants for solving the various problems and difficulties they come across. With the change in the set up of HSL and the reorganisation that was effected at the Plant level towards the end of 1963, an exclusiveness seems to have developed in the Plants. In the questionnaire issued to the various Superintendents and Plant Managers etc. of Operation, Maintenance and Services departments, the Committee had asked a specific question whether the Heads of the Departments and senior officers attended periodical meetings and had communication with the officers performing corresponding functions in the other steel plants with a view to pool knowledge and experience. The Committee has noted with disappointment that 90 per cent of the departmental heads had never been outside their Plants for such purpose. The Committee strongly recommends that the Superintendents and other senior officers of the important departments of the HSL steel plants should meet say once in 4 months, by rotation in different Plants. Occasionally by previous arrangement they should also visit the Steel plants in the private sector.

20.13. Another step that will foster a feeling of unity and Company loyalty, and will lead to substantial improvement in the efficiency of the managerial personnel would be the restoration of the old system of promotions to these grades on inter-plant basis, the first step about which has recently been taken by the HSL. The Committee would like to go a step further and recommend that inter-plant transfers of managerial personnel should also be undertaken in a planned manner to distribute talent equitably in the three plants.

20.14. The Committee also feels that the happenings in the Coke Ovens at Durgapur could have been avoided or at least remedial action would have been taken much earlier, with little loss to the Company, if there had been Functional Directors in the Hindustan Steel's Headquarters or at least there was a highly qualified cadre of expert steel men at the next lower level to advise the Plants.

20.15. The Committee does not feel competent, within its terms of reference, to deal with the Organisation of HSL's Head Office. It has, however, noted with great satisfaction the conclusion of the Committee on Public Undertakings that the Functional Board would be the best suited to Hindustan Steel and that a team of experienced and able Officers from within HSL and the Steel Industry in the private sector be developed to manage and direct the affairs of the Hindustan Steel. The Committee on Public Undertakings has further recommended that the relationship between the Chairman and the Government, and between the Chairman and the General Managers should be defined in writing and that a clear cut procedure laid down in regard to solution of inter-plant conflicts about which the Chairman should have the authority to make a final decision. It is hoped that an early decision would be taken on the future set up of HSL and the relationship between HSL and the Plants.

20.16. Decentralisation and purposeful direction and control are not antithetic or mutually exclusive. The HSL should also be fortified by persons with knowledge, operational skill and managerial experience, preferably in the steel production side itself. The Central Engg. & Design Bureau has its own well defined role and cannot provide the above-mentioned type of experience. Of all the Steel Plant Organisations anywhere, HSL is perhaps the most under-staffed. The Committee feels that the under-organisation at the Head Office can be ended without ending the autonomy of the plants. The recent nationalisation of the Steel Industry in the United Kingdom seems to have been conceived with the idea of having a big viable unit of 20-25 million tonnes under one Central Control so that the latest production techniques may be introduced and research and development may keep pace with the advancement of technology as is happening in other countries with very large concerns. Perhaps some note may be taken of this for developing HSL also on these lines.

20.17. With the reconstitution of the HSL at Ranchi, the only check on the performance of the plants seems to be a study of the statistical production data received from them, and occasionally what comes out of the discussions held at the General Managers' meetings. The probe at Durgapur by the Committee has established that false sense of satisfaction was generated there when the production in the plant touched the targets laid down. There was no independent authority to periodically assess the health of the plant which could have been done only by the HSL if it had the personnel. The Committee is genuinely of the view that the fullest autonomy should be available to the plants to manage their affairs but in addition to their statistical performance, there should be an overseeing of the general health and the real condition of the Plant in respect of its real performance, which can only be judged by an on-the-spot inspection by competent persons. Without in any way interfering in the management of their work, this could be a service function of the HSL, meant more to assist than criticize them. Setting up of periodical Committees of outsiders to check their performance can hardly be good for the morale of a plant and can be avoided by the building of correct attitudes, a profitable association with the other steel plants, and a rapport between an almost autonomous plant and a knowledgeable and purposeful Headquarters.

CHAPTER XXI

CONCLUSIONS

21.1. The Committee has dealt with the problems of the Coke Ovens and the Wheel and Axle Plant in some detail. In the Coke Ovens the immediate necessity is to increase the tempo of repairs to the ovens, improve the operational practices and put back to use the equipment that is out of order. As regards the Wheel and Axle Plant there is need to tighten up inspection and discipline at all points and thereby cut down rejections. In addition to these immediate steps, the Committee has indicated the long-term action to be taken.

21.2. The Committee has also indicated the shortcomings in respect of the working of the various other Departments of the Durgapur Steel Plant and in other allied matters. It has laid great emphasis on long-term measures of a basic nature, which alone can substantially add to the operational efficiency and the productivity of the plant and ultimately lead to large profits. The authorities have started action on some of the suggestions made, already.

21.3. The Committee would also like to emphasize that the situation in Durgapur has been a difficult one over a long period and Top Management have had to deal with many awkward problems. The workers have been restive and unresponsive, which has not made management's task any easier. However, in the desire for producing more, the management on its part did not deal with the labour problems in a firm manner. Nor did it initiate proper measures for ensuring efficiency in operation, maintenance and production control.

21.4. The Committee has been critical of the actions of the Top Management concerned. The Senior Officers in managerial positions have dual roles to play. They must not be content with only solving the day-to-day problems but should put even greater emphasis on long-term plans for continued improvement. They must, therefore, display great foresight in initiating action, well in time, and possess the drive needed for the timely fulfilment of these plans. Apart from a good, plant, there is good human material at Durgapur; these need proper harnessing by good and sound Leadership.

21.5. The Committee feels that the Report has become much bulkier than had been contemplated and perhaps it may give the impression that undue emphasis has been laid on what may appear to be only minor aspects. There have also been unavoidable repetitions but this is because the functions are so inter-related. The Committee's defence is that it was a technical enquiry that the Committee was asked to conduct and since the working of an integrated steel plant is a highly complicated business and even small improvements here and there can make substantial contributions to the development of right attitudes and better performance, many apparently unimportant subjects had to be mentioned and given emphasis.

21.6. A summary of the Report and the important recommendations made by the Committee follow this Chapter and it is hoped that this arrangement will be found useful.

Ranchi
8-4-1967.

Sd./- G. PANDE.

SUMMARY
OF
THE REPORT
AND
RECOMMENDATIONS

SUMMARY OF THE REPORT AND THE RECOMMENDATIONS

Chapter I

Introduction

It deals with the setting up of the Committee to look into the deficiencies and their causes in the Coke Ovens and the Wheel and Axle Plant and the allied and other departments of the Durgapur Steel Plant, assess its overall performance and suggest remedial measures.

Chapter II

Background

In the Durgapur Steel Plant Production was somewhat slow to catch up with the rated capacity which received the notice of the Government and certain policy decisions were taken in 1962 and 1963 to improve production.

Chapter III

Reorganisation

This deals with the reorganisation ordered by the Minister for Steel and Heavy Industries in September, 1963 which gave the Plant Management a larger measure of operating authority and minimised the need of scrutiny by the HSL and the Ministry. The production at Durgapur after reorganisation was quite rapid but the management seemed to have neglected many essential responsibilities like proper maintenance, lack of rigid control on quality of products, checking staff indiscipline and building up of staff competences. The Committee has felt that on the whole the well intentioned re-organisation did not bring about substantially the anticipated results.

Chapter IV

Developing Performance

The Committee has given details of the systems found useful for aiding and developing performance.

Chapter V

Overall Plant Performance

In this Chapter the Committee has given the performance indices of the Durgapur Plant from 1963-64 upto December, 1967. It has been brought out that the production having caught up in 1963-64 and 1964-65 the indices started going down in 1965-66 when Durgapur incurred a loss of Rs. 3·31 crores. Due to the heavy damage to coke oven batteries in the 1st quarter of 1966, the production got affected all round and 1966-67 has been even a much worse year and the loss is estimated at over Rs. 13 crores. The difficulties of Durgapur Steel Plant have been enumerated and the general causes in the decline of the performance have been found as inadequacy of management systems, some inadequacy of equipment, slow development of the skills and abilities of the workers and unhelpful employee attitudes generated by the Unions.

Recommendations

1. The Plant should improve control over quality of raw materials, processes and products and reduce its off-grade production and high inventories, to reduce the cost of production.

2. The management should take special action to arrest the fall in labour productivity and increase it substantially by adopting the methods used for improving performance as given in para 5·13 etc.

3. A special study should be made of the 27 numbers of equipments and attachments, which are lying idle in the plant, to determine their usefulness in the Durgapur Plant or elsewhere.

Chapter VI

Coke Ovens

The Coke production (dry) which was 102 per cent of the target capacity in 1963-64 and 100 per cent in 1964-65 fell down to 95 per cent in 1965-66 and in the first three quarters of 1966-67, it has come down to 64 per cent due to serious damage to the coke ovens. The damage has been caused by wrong operating practices, neglecting maintenance and ineffective inspections and this is in spite of ample warnings having been received in the past. The repairs are being undertaken by M/s. Simon Carves under the advice of a consultant and are expected to be completed by December, 1967. It has been estimated that the repairs will cost Rs. 75 lakhs. Rs. 5·75 crores will be the loss to the plant in 1966-67 and Rs. 4 crores in 1967-68 due to the trouble in the Coke Ovens.

Recommendations

1. The pace of repairs should be stepped up and staff of the refractory department be associated with the work for getting trained.

2. Duties should be prescribed for all staff, and proper maintenance schedules be laid down and acted upon and good housekeeping enforced.

3. The standard 3 shift system should be introduced in place of the 7 days rota system.

4. Bonus system should be re-examined and put on a more scientific footing.

Chapter VII

By-products Plant

The various units of the by-products plant at Durgapur were commissioned in 1960-61 but the performance so far has been very unsatisfactory except for the tar plant. The low yields are caused mainly by the deficient operation of the plants and negligence in maintenace, which have led to substantial losses, being as high as Rs. 95 lakhs during 1966-67.

Recommendations

(i) maintenance must be considerably improved and operation of the plant put on a proper footing;

(ii) the plant be placed under the independent charge of a Superintendent reporting directly to the General Superintendent.

Chapter VIII

Blast Furnace Department

The Committee considers the performance of the blast furnances as satisfactory in keeping with the quality of raw materials and coke supplied to it.

Recommendations

(i) Efforts must be made to attain coke rate of 750 Kg per tonne. For this additional facilities like use of sinter, top pressure, high blast temperature etc. have to be put to use.

(ii) Control at the Blast Furnace stage must be exercised to keep the silicon content within 1·35 per cent.

(iii) The rising costs and lower productivity should be examined by the Plant Management.

(iv) Excessive loss due to the bleeding of blast furnace gas to atmosphere should be looked into and efforts made for its better utilisation, especially in the power plant.

Chapter IX

Steel Melting Shops

Generally speaking off-grade production is high and bunching of heats at shift ends is excessive. The house keeping is poor.

Recommendations

(i) A detailed study should be made to reduce bunching at shift ends and to control off-grade production.

(ii) The house keeping and removal of slag should be improved and it is recommended that the Industrial Engineering Department should be asked to make a study of the problem of removal of slag efficiently.

(iii) Flue dust cleaning arrangements should be repaired and put into proper working order.

Chapter X

Rolling Mills

Soaking Pits: The present number of Soaking pits available at Durgapur is inadequate and the Committee has endorsed the recommendation of HSL that, in all, 20 soaking pits should be provided at 1.6 MT stage.

Rolling Mills: The performance of the Section Mill and Merchant Mill was satisfactory in 1965-66 but the performance of the Blooming and the Billet Mill has been unsatisfactory. The down-time in various mills has been excessive. Off-grade production has also been high.

Recommendations

(i) The Operating practices should be improved and more effective inspections should be introduced at different stages to reduce the off-grades.

(ii) The maintenance should be strengthened and streamlined to reduce the excessive down-times.

(iii) The declining trends of labour productivity should be examined and if there is over-manning at any point, it should be rectified at 1·6 MT stage.

(iv) The Bonus scheme should be rationalised.

Chapter XI

Wheel and Axle and Sleeper Plant

The Wheel and Axle Plant has not achieved its rated capacity of production due to the quality of steel supplied, the inexperience of the staff, the various defects that come up in the processes and finally, the lack of certain essential machine tools. The Committee was able to bring together the plant and the Railway authorities and many of the difficulties between them have been overcome. Although by better control, the production of wheels can be slightly increased, high level production can only be achieved when the electric furnace gets into operation and the additional machine tools have been installed.

Recommendations

(i) The working of the plant be examined by a team of foreign and Indian experts well-versed in wheel steel making and processing. It will also be advisable to send two senior officers abroad to make on the spot study of the techniques of the corresponding plants.

(ii) Inter-stage inspection by Research and Control should be strengthened.

(iii) A proper system of production planning for this plant should be instituted at an early date.

(iv) A detailed study is called for to correct the defects in the present bonus scheme.

Sleeper Plant

The rejections in the Sleepers are mainly due to metallurgical, rolling and pressing defects. The defects can be reduced by proper checks during operation, proper maintenance of the plant and by improvement in the production techniques. An experiment suggested by the Railways should be carried out. Finally the bonus scheme should be linked up with production of first class sleepers only.

Recommendations

(i) Maintenance should be improved at all points and metallurgical, rolling, and pressing defects should be minimised by better control on processes and operations.

(ii) A proper study should be made to determine the correct basis of payment of incentive bonus to the staff based on good performance.

(iii) Durgapur Plant should give on loan the sleepers required by the railways for carrying out certain tests which if successful will bring down the rejections in sleepers considerably and will also help in the reduction of the present stocks.

Chapter XII

CEM Shops & the Foundry

The production in the CEM shops has been above target but should be further stepped up so that more spares will be manufactured in the Shops. This can be done by providing balancing equipment, minor improvements in the layout and by better planning and supervision. It is, however, found that the machine utilisation is low.

Recommendations

(i) Time studies should be made to determine standard time for different jobs.

(ii) A study be made to see if the system of production planning and control for the shops is adequate and effective and if not it should be streamlined.

(iii) Balancing tools and additional staff needed to improve production should be considered so that the maximum possible load of making spares may be taken on by the shops.

Foundry: Although the performance of the Ingot Mould Foundry had been satisfactory in the past, during 1966-67 the production has shown a declining trend and the rejections are also rather high. The production of miscellaneous castings, steel castings and non-ferrous castings which was low has further come down in 1966-67. The performance of the Foundry on the whole is considered unsatisfactory.

Recommendations

(i) Proper studies should be made to determine standard times for different jobs for determination of a rational bonus scheme based on efforts of the individuals and groups.

(ii) It should be ascertained if the system of production planning and control is adequate and effective and it should be streamlined.

(iii) The control of the foundry should be removed from the charge of the Chief Superintendent (C & I) and should be put under the charge of a new post of Superintendent (Shops and Foundry) so that the shops and the foundry work as complementary units under him.

Chapter XIII

Maintenance

It is a matter of regret that maintenance which is vital aspect of Plant Management has so far been sadly neglected at Durgapur. The result of bad maintenance in the coke ovens has had a very adverse effect throughout the Plant.

The Committee has discussed the pros and cons of the various types of maintenance and is of the view that the organisation and system of maintenance in vogue at Bhilai where maintenance is partly decentralised is the best pattern for steel plants. However, the Committee leaves it to the Durgapur management to decide whether they will continue the present fully centralised maintenance or switch over to the Bhilai system at a proper time.

Recommendations

(i) An inspection organisation should be set up at the Durgapur Steel Plant under the General Superintendent for making detailed inspections, according to prescribed schedules, of all the assets of the plant.

(ii) The centralised maintenance organisation should be geared to discharge its duties in an efficient manner, to arrange for spares in time and to develop competence in the men.

(iii) Preventive maintenance and inspection procedures at Durgapur should be put on a sound footing. Proper preventive maintenance system must provide for detailed annual and monthly plans for shut downs of the equipments to be prepared in consultation with all concerned.

Chapter XIV

Materials Management

Overall material productivity shows that there is scope for reducing the consumption rates of various materials. The inventories of spares and stores and semi-finished and finished goods are also high and could be reduced. The system at Durgapur for planning and procurement of spares is not quite satisfactory. The quality of coal and iron ore has been deteriorating.

Recommendations

(i) Stricter consumption norms for various kinds of materials will have to be adopted and any further increases in the usage are to be resisted.

(ii) Joint sampling of coal at destination must be made obligatory.

(iii) Introduction of selective preparation of coal has to be actively considered at least on experimental basis.

(iv) Inspection Wings for materials must be strengthened in order to improve quality and quantity control on raw materials.

(v) Efforts should be made to reduce inventories of spares, stores, and semi and finished goods.

(vi) The Committee has already recommended to the General Manager the creation of a high level organisation for planning and procurement of spares. This is essential for an effective spares management, as an essential aid in Plant Maintenance.

Chapter XV

Production Planning & Control

The Committee has made a comparative study of the organisations and systems for Planning and Control of Production of various Steel plants. The activity at Durgapur which is being performed at different points should be centralised and its scope widened. The Committee is of the view that to be able to control production effectively in a gigantic steel plant, it is essential that information on conditions of the shop floor and performance of the various shops keeps on following to the higher management to enable them to take action in time. In the opinion of the Committee, the organisation and system of production planning and control adopted at Bhilai provided the real answer in the complex set up of a steel plant.

Recommendations

(i) A few Officers from Durgapur Steel Plant should study the system in vogue at Rourkela and Bhilai in order to instal an effective system of plant control at Durgapur;

(ii) Departments of Production Planning & Control, and Energy and Economy should be placed under the new post of the Assistant General Superintendent incharge of coordination of all activities.

(iii) Production Control Cells should also be placed under the Department of Production Planning. At a later stage, the direct maintenance functions of the Energy and Economy Department may be transferred to the Chief Electrical Engineer and he may be redesignated as Power Engineer on the pattern of Bhilai.

(iv) The services of the Department of Production Planning should be utilised for codification, upkeep and issue of all operation and maintenance instructions, procedures etc.

Chapter XVI

Performance Control and Development

The role of various departments concerned with assessment and improvement of efficiency and the related systems have been considered. The functions performed by the departments of Energy and Economy, Industrial Engineering, Research and Control, Internal Audit have been examined. It is found that there is a lot of scope for making use of the services of these units to attain better and efficient performance in future. The existing suggestion scheme at Durgapur has not been effective in inspiring and motivating personnel to give suggestions. An assessment making Organisation has been suggested.

Recommendations

(i) The function of manpower planning should be transferred from the Personnel Department to the Industrial Engineering Department. Similarly the Production Control Cells at the Steel Melting Shops and the Soaking pits should be transferred from the Industrial Engineering Department to the Centralised Department of Production Planning and Control.

(ii) The Industrial Engineering Department and Research Control Departments should be placed under the General Manager. A separate wing in the Research Control Department may be established for carrying out investigations into the failures on the metallurgical and chemical fronts.

(iii) The Management should make a complete review of the existing suggestion scheme and analyse the causes for the lack of its effectiveness and devise measures to make is work better.

(iv) A Technical Wing headed by an Assistant General Superintendent and assisted by say, two qualified and experienced Engineers should be created to assist the General Superintendent for watching the performance of the plants, removing bottlenecks, improving efficiency and reducing costs.

(v) It will be most desirable to create half a dozen posts of Specialists at very senior levels in the headquarters of HSL who should be highly experienced experts in the different aspects of iron and steel technology.

(vi) For the purpose of assessing the performance and productivity of the various units in HSL in detail and to give suggestions for improvement. Performance Assessment and Development Teams should be formed with one of the Technical Officers in the Head Office as its Convener. The other Members should be the representatives of the Departments concerned, Industrial Engineering Department and the Cost Branch. A scrutiny by such teams must be conducted simultaneously in all the plants in the same units and with the same Head Office Officer as Convener to ensure uniformity of approach and to get better results.

(vii) Inspections of each section of the Plant by officials higher up in the hierarchy than the departmental heads must be undertaken up as a matter of normal top management policy, the aim being to assist the Plant in doing better.

(viii) A Development Council should be created with General Manager as its Chairman, Chief Industrial Engineer as its Secretary and some key top Officials as Members in order to determine annual development plans for the various departments well in advance of the coming year.

Chapter XVII

Personnel Management and Industrial Relations

Most of the difficulties in the sphere of personnel management at Durgapur emanate from the fact that not much efforts had been made to develop a trained and disciplined labour force as emphasis was always placed on reaching the production targets and dealing with problems on routine and day-to-day basis. This was further aggravated by the presence of rival unions. The safety record of the Plant has been good.

Recommendations

(i) Detailed work studies must be undertaken to determine the manning requirements of the various departments of the Plant on a scientific basis. This work should be done by the Industrial Engineering Department. The manpower planning should be considered by the Head office and the final decision on manning at various levels taken on a comparative basis for all Plants.

(ii) The existing imbalance in the ratio of direct recruits to promotees to posts in the grade of 400-950, should be corrected.

(iii) The flight of experienced personnel from the plant should be checked.

(iv) It is necessary to finalise the promotion policy for non-executives and make it known to all concerned.

(v) Effective channels of promotion should be laid down.

(vi) The training effort has to be intensified to take care of the training needs specially in departments like Wheel & Axle Plant. The Training Department should be placed under the Personnel Manager.

(vii) The Industrial relations situation at Durgapur has not been very happy, and efforts should be made to improve staff discipline by making various Committees like the Works Committee, Labour Committee function properly.

(viii) The calibre of Officers in the Personnel Department has also to be improved.

(ix) Instead of getting a Personnel Manager from the State Services it will be more prudent to select a proper person having requisite qualifications from HSL plant cadre or if such a person is not available, from outside sources, on a permanent basis.

Chapter XVIII

Incentive Scheme

The details of the scheme have been discussed in the Report. It is the feeling at Durgapur that the present Bonus Scheme is not of much help in increasing productivity.

Recommendations

(i) Management should rationalise the scheme on individual or inter-dependent group basis after Work Studies have been conducted by the Industrial Engineering staff to the necessary extent.

(ii) The system of production reporting and computation of bonus earnings should be streamlined. The Industrial Engineering Department should compute the earnings on the basis of the production reports rendered by the Inspection agencies.

(iii) All levels of all the departments of the Plant should be covered by properly instituted bonus schemes.

Chapter XIX

Financial Management, Cost Control and Sales

In this chapter a few aspects having a bearing on efficiency and profitability of the Plant have been considered. It is found that operation budget is being prepared only to obtain fund authorisations and not for profit planning. The costs show a rising trend in most areas. There is a lot that Durgapur must do in the fields of production planning, actual production techniques, and quality of products in order to achieve customer satisfaction.

Recommendations

(i) The Plant should prepare realistic operation budgets based on sales, the final budget culminating in planning action in various areas for achievement of profit objectives. The Budget must be regarded as an instrument for profit planning and control.

(ii) Adequate control must be exercised to minimise all kinds of losses but special attention should be given to the large number of thefts in the plant.

(iii) Strict watch on over-time payments should not only be continued but efforts should be made to reduce them.

(iv) There is a very good case for effecting economy in the subsidy/deficit due to the provision of amenities and conveniences to staff. Facilities provided by the Plant for transport should be gradually withdrawn without causing any undue hardships to workers and staff.

(v) A Permanent Standing Committee for cost reduction should be formed to study costs of departments, one by one. Cost consciousness should be built up in the entire organisation.

(vi) Cost and performance data should be supplied appropriately and in time, to all levels of executives including the Assistant Foremen.

(vii) The system of standard costing should now be introduced.

(viii) The entire policy of the Plant must be directed towards meeting the customer requirements. Substantial improvement is required in order to make the products of Durgapur exportworthy.

Chapter XX

Plant Re-organisation and HSL

This chapter mainly contains the recommendations of the Committee on the organisational changes to be brought about in Durgapur and HSL.

Recommendations

(i) Duties and responsibilities of all non-executive and executive personnel upto the level of the General Superintendent must be defined and made known to them.

(ii) There should be no intermediary level between the General Superintendent and the Departmental Heads, who should report to the former directly.

(iii) The scale of pay for the Superintendents of major departments should be enhanced.

(iv) A post of Asstt. General Superintendent should be created, who will be in charge of the proposed Department of Production Planning and Control and will effect the necessary coordination between the heads of the various departments.

(v) A reshuffling of some departments between the Commercial Manager and the Officer-on-Special Duty (Town) would be most desirable.

(vi) Advisory Council should be formed to assist the Officer-on-Special Duty in the sphere of welfare activities of the Township. The odd designation of OSD should also be corrected.

(vii) A post of Coordination Manager, reporting to the General Manager be created, who will coordinate the work of Industrial Engineering and Research and Control Departments, besides performing other functions.

(viii) Composite teams of CMERI and HSL should be formed in order that maximum advantages accrues to both organisations.

(ix) The Superintendents and other senior officers of important departments in HSL, should meet regularly for pooling and exchange of knowledge and experience.

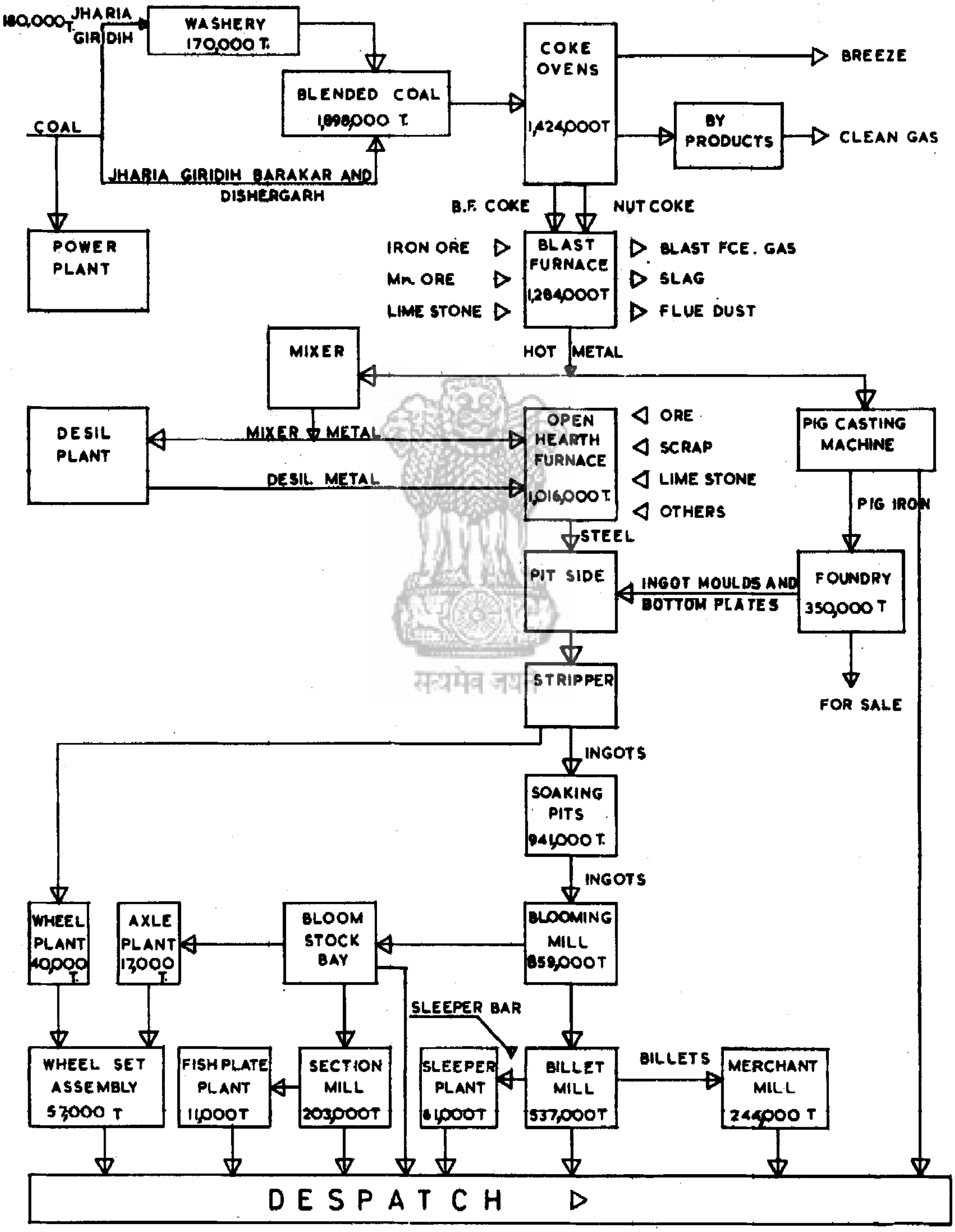
(x) Promotions to managerial posts should be made on inter-Plant basis and transfers at these levels should also be undertaken in a planned manner.

ANNEXURES

ANNEX II A

D.S.P.
PROCESS FLOW CHART
1 M.T.

ALL FIGURES IN TONNES



ANNEXURE I-A

Ministry of Iron and Steel

New Delhi, the 12th September, 1966

No. DUR-21(4)/66.—For sometime now, shortcomings in the performance of the Durgapur Steel Plant which have also been reflected in the working results of the plant's operation have been causing concern both to Hindustan Steel Limited and to Government. The output of the Wheel and Axle Plant has been consistently short of rated capacity. There have also been heavy rejections in this unit. These have been ascribed, to some extent, to deficiencies in the Steel Melting Shop and consequently, in the quality of steel made. Recently, the output in the Coke Ovens also has shown a significant decline, affecting production of the Plant as a whole. From a first technical enquiry, it would appear that the condition of the Coke Ovens leaves a lot to be desired and that a concerted programme of repairs is necessary to restore normal operating efficiency. Some action is already in hand in this regard.

2. Government feel that an independent expert review of these problems in their individual as well as integrated aspects would be helpful at this stage, in order to enable remedial action to be taken for removing the deficiencies which are affecting overall and detailed Plant performance. Government have therefore in consultation with and with the concurrence of Hindustan Steel Ltd. decided to appoint a one-man committee consisting of Shri G. Pande, Vice-Chancellor, Roorkee University, to conduct such an expert review. He will identify and assess the deficiencies and ascertain the causes therefor, in the particular units mentioned above as well as in allied departments which may have contributed to these deficiencies. He will also assess the overall performance of the Steelworks and recommend steps necessary to secure rapidly full and efficient performance, additionally to action which Hindustan Steel Ltd. may already have taken.

Shri Pande will report to Government by 15th December, 1966.

ORDER

Ordered that this may be published in the Gazette of India Extraordinary for general information.

T. Swaminathan, Secy.

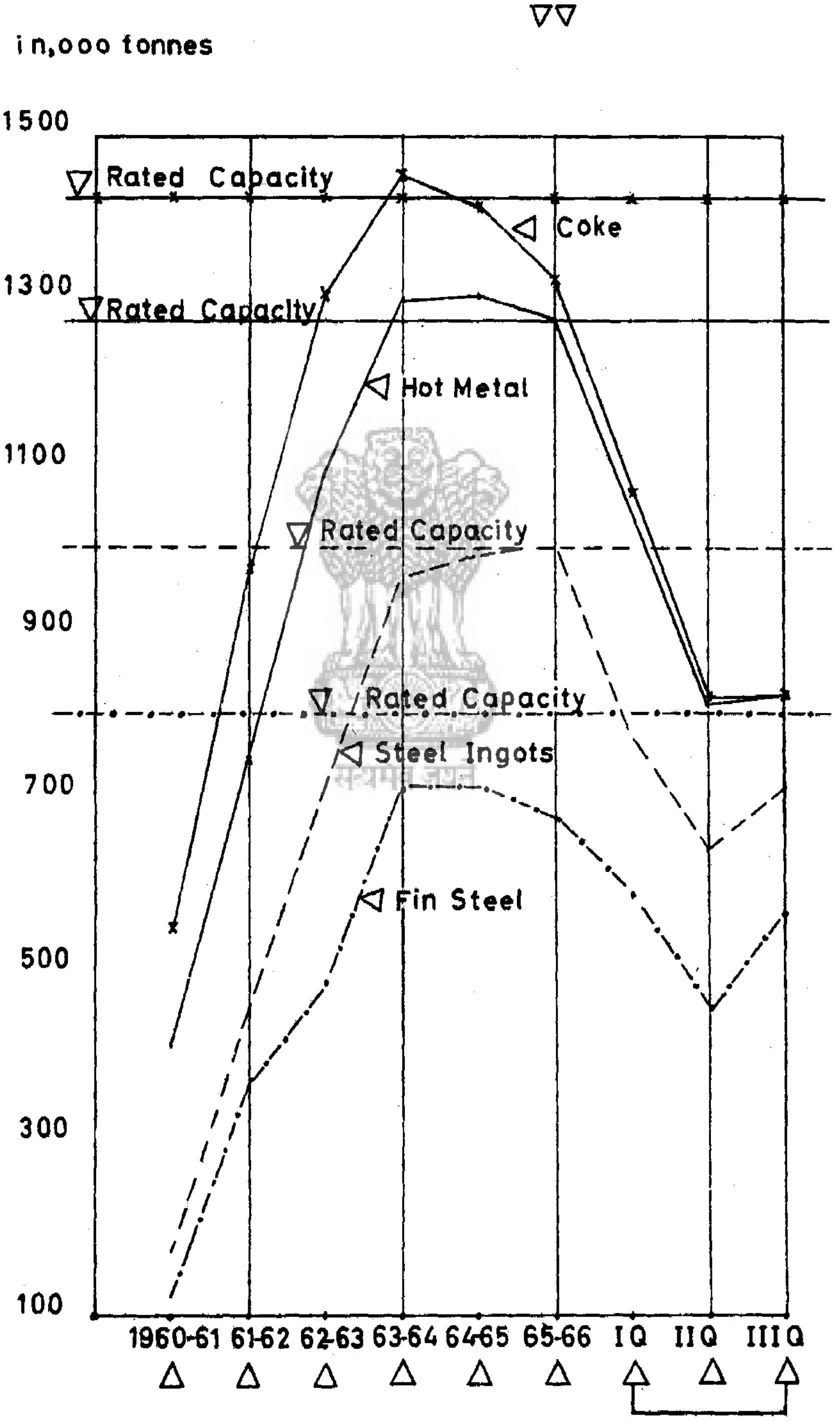
ANNEXURE II-B

% Achievements on rated Capacities

Years	Coke (Dry)		Hot Metal		Steel Ingots		Saleable Steel (Semi & Finished)	
	Prodn. (000 T)	% on R.C.	Prodn. (000 T)	% on R.C.	Prodn. (000 T)	% on R.C.	Prodn. (000 T)	% on R.C.
1960-61	555	39	420	33	168	17	118	14
1961-62	980	70	764	59	462	45	362	43
1962-63	1317	92	1108	86	731	72	486	58
1963-64	1457	102	1302	101	972	96	721	89
1964-65	1418	100	1313	102	1006	99	721	89
1965-66	1350	95	1280	100	1001	99	684	84
1966-67—I Qr. . .	267	75	260	81	196	77	149	73
II. Qr. . .	206	58	205	64	162	64	115	56
III. Qr. . .	208	58	208	65	181	71	142	70

*Wet.

PRODUCTION


▽▽
in,000 tonnes
1500
1300
1100
900
700
500
300
100
▽ Rated Capacity
◁ Coke
▽ Rated Capacity
◁ Hot Metal
▽ Rated Capacity
▽ Rated Capacity
◁ Steel Ingots
◁ Fin Steel
1960-61
61-62
62-63
63-64
64-65
65-66
IQ
IIQ
IIIQ
△ △ △ △ △ △ △ △ △

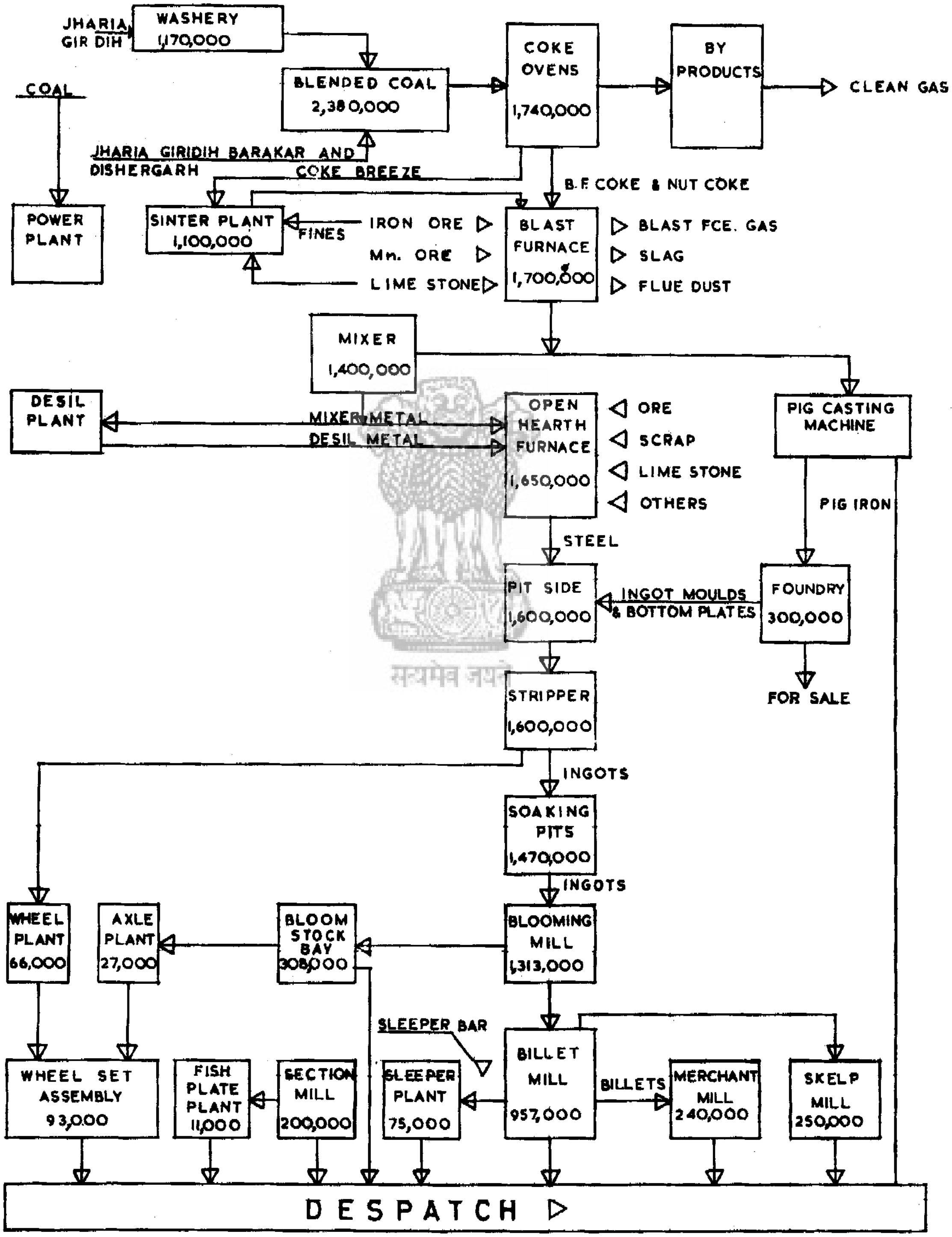
ANNEX II C

D. S. P.

PROCESS FLOW CHART

▷ 1·6 M.T.

ALL FIGURES IN TONNES



ANNEXURE V-A

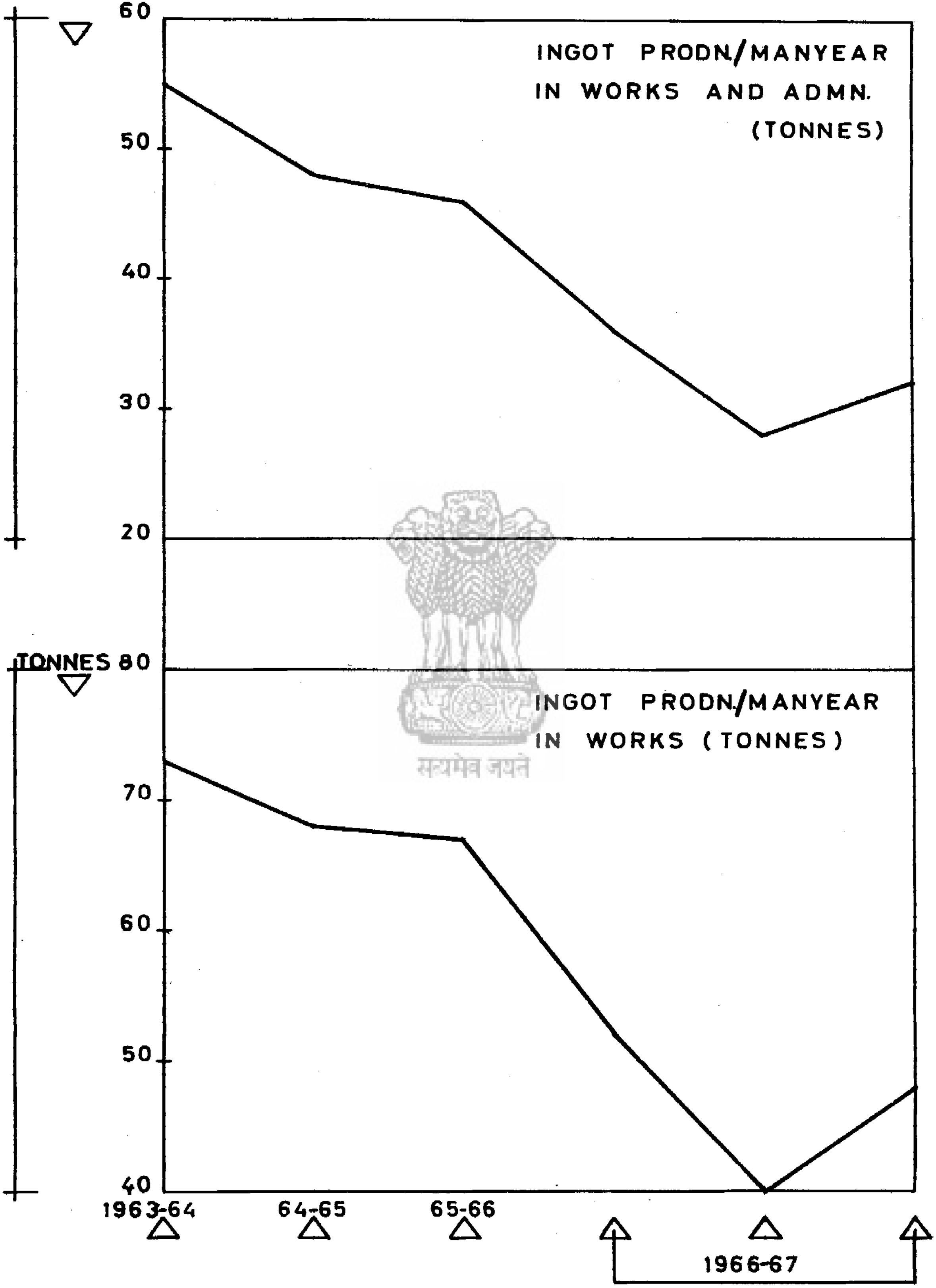
Hindustan Steel Limited, Durgapur Steel Plant

(Rs. in lakh)

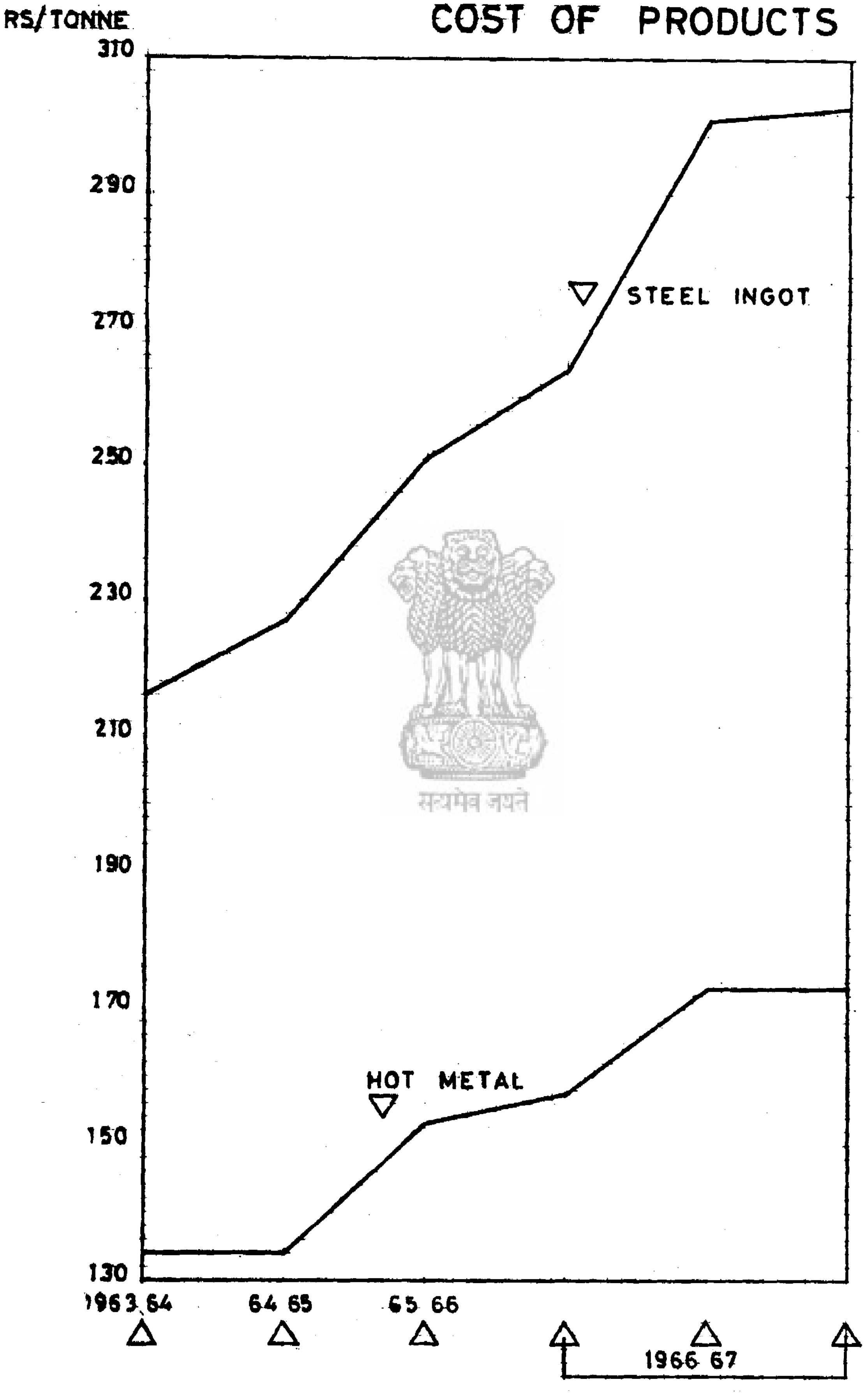
Description	Unit	Standard or Design Figure	1963-64	1964-65	1965-66	1966-67			
						1st Qr.	2n Qr.	3rd Qr.	4th Qr.
1	2	3	4	5	6	7	8	9	10
1. *Output of Main Products:*									
(*i*) B. F. Coke (Wt.) . .	'000 T	1,387	1316	1276	1237	243	186	189	198
(*ii*) *By-Products:—*									
(*a*) Crude Benzol . .	'000 KL	15	6	5	9	2	1	2	2
(*b*) Crude Tar . . .	'000 T	57	56	51	54	10	7	8	11
(*c*) Ammonium Sulphate .	'000 T	21	15	18	16	3	2	2	2
(*d*) Sulphuric Acid . .	'000 T	22	13	16	15	3	2	3	3
(*iii*) Hot Metal . . .	'000 T	1,284	1302	1313	1280	260	205	208	214
(*iv*) Ingot Steel . . .	'000 T	1,016	972	1006	1001	196	162	181	230
(*v*) Finished Saleable Steel and Semis . . .	'000 T	814	721	721	684	149	115	142	157
2. % of achievement on rated capacity :									
(*a*) Ingot			96	99	99	77	64	71	91
(*b*) Finished Steel. . .			89	89	84	73	56	70	77
3. *Despatches:*									
By-Products . . .	'000 T '000 KL		263 2	212 3	289 5	54 1	27 ..	55 1	41 1
Pig Iron	'000 T		400	386	336	56	48	53	51
Finished Saleable Steel and Semis	'000 T		763	722	723	155	124	147	153
4. Total Value of Despatches .	Rs.		5785	6220	6547	1318	1065	1284	1300
5. Finished & Semi-Finished inventories as at the end of the year	Rs.		550	774	1092	1104	1116	1061	
6. Value of Raw Materials stock as at the end of the year. .	Rs.		169	135	171	198	154	119	
7. *Cost of Production:*									
(*a*) Raw Materials . .	Rs.		1903	1912	2077	436	368	373	
(*b*) Payments to & Prov. for Employees . . .	Rs.		571	698	892	232	198	237	
(*c*) Stores and Spares . .	Rs.		606	593	574	138	114	142	
(*d*) Depreciation . .	Rs.		929	1175	1197	299	300	316	
(*e*) Interest	Rs.		513	513	516	132	142	137	
(*f*) Others (after adjusting accretion/decretion to stock of Finished Prod.) . .	Rs.		1364	1377	1618	386	340	474	
TOTAL	Rs.		5886	6268	6874	1623	1462	1679	

1	2	3	4	5	6	7	8	9	10
8. Total of Maint Cost	Rs.		476	562	609	132	115	120	
9. *Payments—*									
(i) Salaries & Allowances	Rs.		462	543	691	173	172	186	190·8
(ii) Overtime	Rs.		53	76	106	30	13	12	12·5
(iii) Bonus	Rs.		56	69	74	9	28	10	11·5
10. Profits	Rs.		(—)19	53	(—)231	(—)284	(—)374	(—)375	(—)309
11. *Cost of Products—*									
(*a*) Coke	Rs.		57·03	62·22	68·22	70·74	81·63	82·21	
(*b*) Hot Metal	Rs.		134·43	134·27	152·67	157·16	172·92	173·73	
(*c*) Ingots	Rs.		216·04	227·43	251·72	264·38	302·85	303·37	
12. *Men on—*									
(*a*) Works (Mid year)	Nos.		13,283	14,377	14,942	15,446	15,583	15,789	
(*b*) Works & Admin (Mid Yr.)	Nos.		18,872	20,807	21,885	22,409	22,576	22,816	
13. *Productivity—*									
(*a*) Ingot production/man year in works	T		73	69	67	51	41	46	58
(*b*) Production/man year in works and administration	T		52	48	46	35	9	32	36
(*c*) Material productivity Total tonnage of ingot steel/Total tonnage of input of raw materials	T		0·277	0·285	0·273	0·266	0·278	0·272	0·273

PRODUCTIVITY

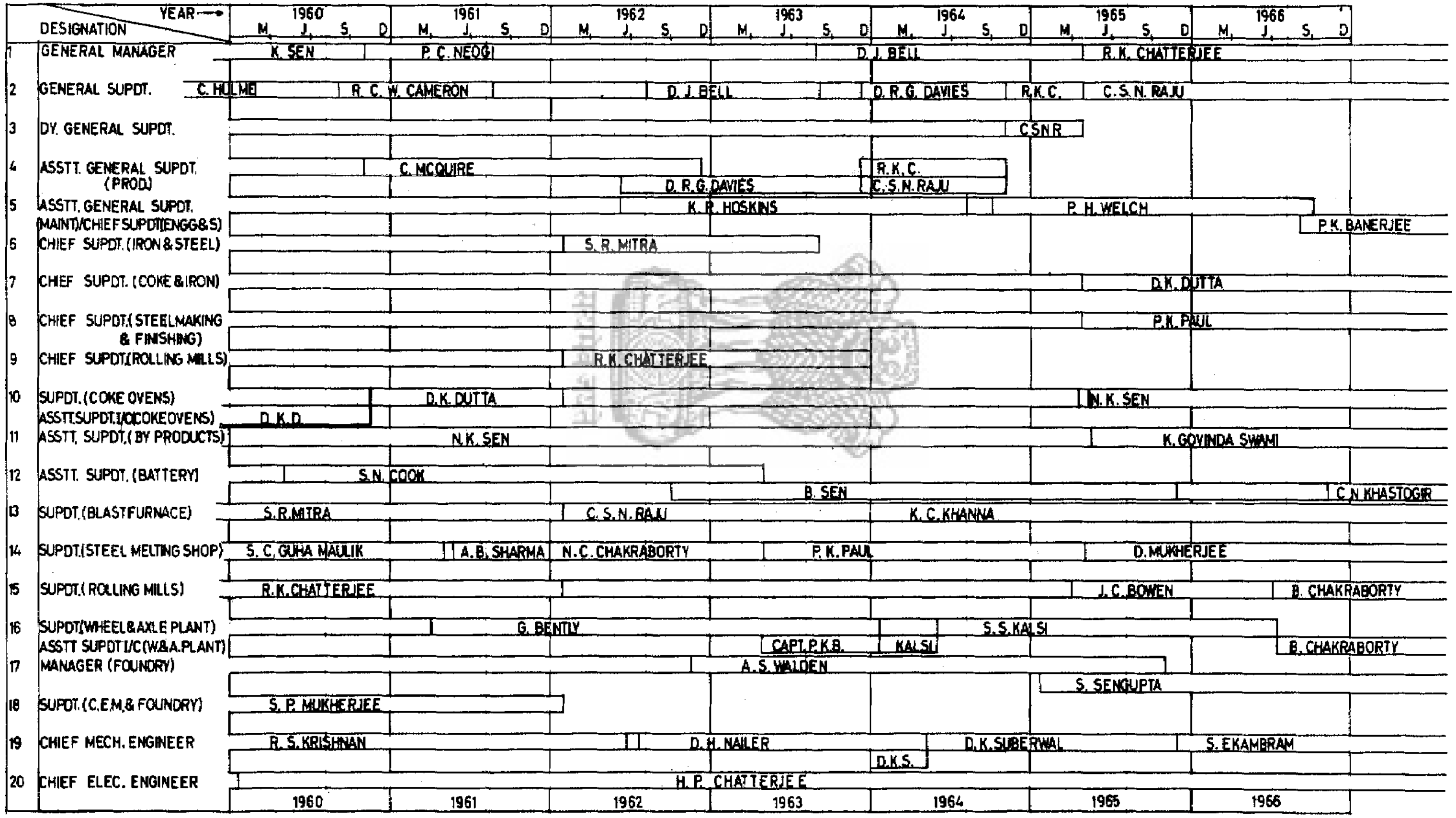


COST OF PRODUCTS



ANNEXURE V-B

DURGAPUR STEEL PLANT
CHART OF OFFICERS IN POSITION



ANNEXURE V-C

A. COKE OVEN AND BY-PRODUCT PLANT

1. Mimic Control Panel to centralise the Coal Handling Operation.

2. Facility for handling additional fine in the Coal Washery. (In actual practice, it was found that the fines in the coal was higher than originally anticipated and hence the above facilities are required to attain rated capacity of the Coal Washery).

3. Additional stand-by pumps in the existing Washery.

4. Additional storage bunkers for coal to be washed.

5. Modification to spillage chute of pusher cars.

6. Barrel filling and loading facilities for benzol and tar.

7. Naphthalene Bag store.

8. Standby Hot naphthalene press.

9. Existing slurry screen under-flow to the new thicker.

10. Tippler for Box wages.

B. BLAST FURNACE PLANT

1. Humidity control equipment comprising metering, indicating and recording instruments to maintain a constant humidity for the blast at any required level.

2. Equipment for oxygen enrichment of the blast to enable a pre-determined degree of oxygen enrichment of the blast.

3. 3 Surge tanks on the return water mains to avoid air locks in the water circulation system.

C. STEEL MAKING SHOP

1. *Slag Disposal System*

Under 1 Million Ton plant the slag ladle transfer cars and slag thimbles were provided for the disposal of the slag and debris from the SMS pit site as well as from underneath the front flushing hole. Under 1·6 Million Ton expansion this system has been withdrawn and provision has been made to handle the slag and debrises from SMS by excavators and dumpers. Suitable number of such equipment has been provided under this expansion scheme.

2. *New Scrap Yard*

For feeding the scrap to SMS, under million Ton plant a single scrap yard located at the Southern side of the shop has been provided and the scrap could only be brought to the stage from one side of the Melting Shop building. Under 1·6 Million Ton expansion, a new scrap yard with handling facilities have been provided at the Northern end of the furnaces and with this new installation, it will now be possible to feed the scrap from both sides of the melting shop building which will considerably ease the movement of the raw materials.

3. *Oxygen lancing facilities*

Though the hoisting lowering gear mechanism and branch pipe works have been provided under 1 Million Ton, Oxygen could not be successfully used in the furnace due to the lack of proper cooling water facilities and Oxygen. This has been incorporated under 1·6 Million Ton expansion. Also a ring main for Oxygen has been provided inside the shop in place of a single feeder main, which will improve the distribution condition of Oxygen.

4. *Mobile Machine*

Several mobile machines namely Gradall, Hyster crane, Repair crane have been provided under 1·6 Million Ton expansion for better handling of the materials on the furnace stage and will be utilised both for operation and maintenance.

5. *5-T Semi Portal Crane*

A 5-T semi-portal crane has been provided under 1·6 Million Ton expansion to handle the refractory and other materials for the ladle relining.

6. *Emergency Track for Hot Metal Supply*

Under 1 Million Ton Plant only a single track was provided on the stage to carry hot metal from the mixer to the furnaces. Under 1·6 Million Ton Expansion an emergency track at ground level with suitable opening at the platform level has been provided as a safeguard against any breakdown in the existing hot metal track system.

7. *Raw Dolomite Crushing System*

Under 1 Million Ton there was no provision of crushing the raw dolomite in D.S.P. Dolomite chips were purchased from outside suppliers which contained considerable amount of undesirable fines. Under 1·6 Million Ton expansion a complete dolomite crushing system including conveyors, crushers, and screens have been provided which will enable the plant to crush their own feed material from lumps, thereby having direct control over the raw material feed to the kilns. This is expected to improve the quality and plant performance.

8. *Burnt Dolomite Storage System*

Under 1 Million ton plant, there was no provision for storing burnt dolomite from the kiln. Under 1·6 Million Ton expansion, suitable facilities for storing the burnt dolomite has been provided with extra facilities for conveyance by road transport. Two storage silos of 500 Ton capacities each with all ancilliary equipment have been installed.

9. *Mould Cooling System*

Under 1·5 Million Ton expansion an elaborate mould cooling system has been provided to facilitate cooling of ingot moulds coming from the stripper yard. This system will improve the mould turn over to S.M.S.

ANNEXURE VI-A

Performance of Coal Washery

Sl. No.	Item description	Unit	Standard or design figures	63-64	1964-65	1965-66	1966-67		
							1st Qr.	2nd Qr.	3rd Qr.
1.	Raw coal input	'000 T.	1,800	945	1,049	1,070	217	188	165
2.	Washed coal output . . .	'000 T.	1,170	721	843	800	156	136	120
3.	Ash in washed coal	%		*17·2	17·3	17·7	17·6	17·3	16·8
4.	% achievement on rated capacity (Input coal)	%		52·5	58·3	59·4	48·2	41·8	36·7
5.	Yield of : (i) washed coal .	%	65	76·3	80·4	74·8	71·9	72·5	72·6
	(ii) middlings .	%	25—30	17·3	11·9	18·6	20·6	16·6	16·4
	(iii) rejects . .	%	5—10	6·4	7·7	6·6	7·5	11·0	11·0
6.	*Delays :*								
	(i) Time lost to available time .	%	Not available						
	(ii) Operation delays . .	%							
	(iii) Mechanical delays . .	%							
	(iv) Electrical delays . .	%							
7.	*Input of Labour:*								
	(i) Men on roll (Mid. year) . .	Nos.		123	133	136	140 (for three quarters)		
	(ii) Overtime payments . .	Rs.		29,000	54,000	75,000	11,500 (total of the year)		
8.	*Productivity :*								
	Raw coal input/man year . .	T		7,683	7,887	7,868	5,428 (for three quarters)		

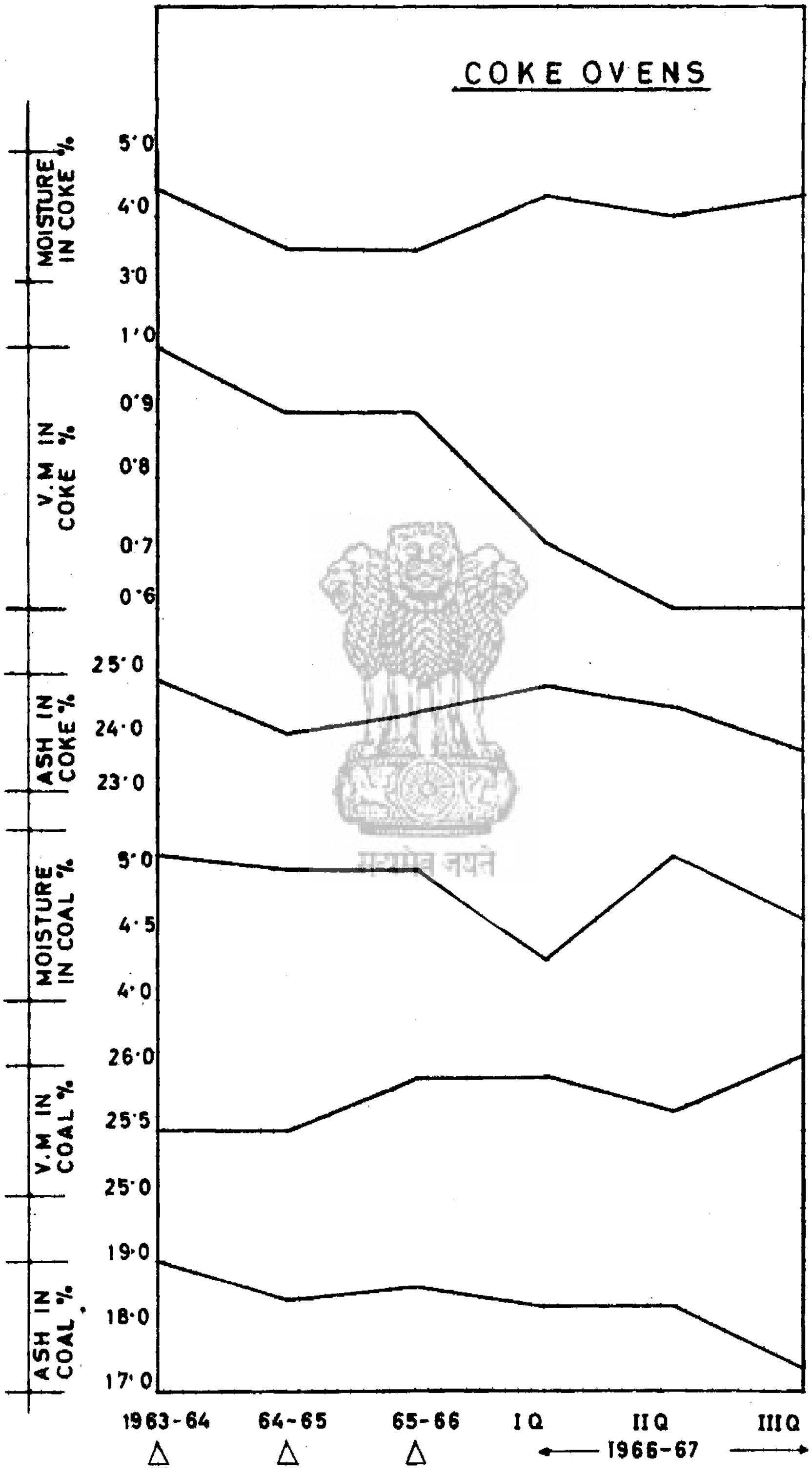
*For 9 months.

ANNEXURE VI-B

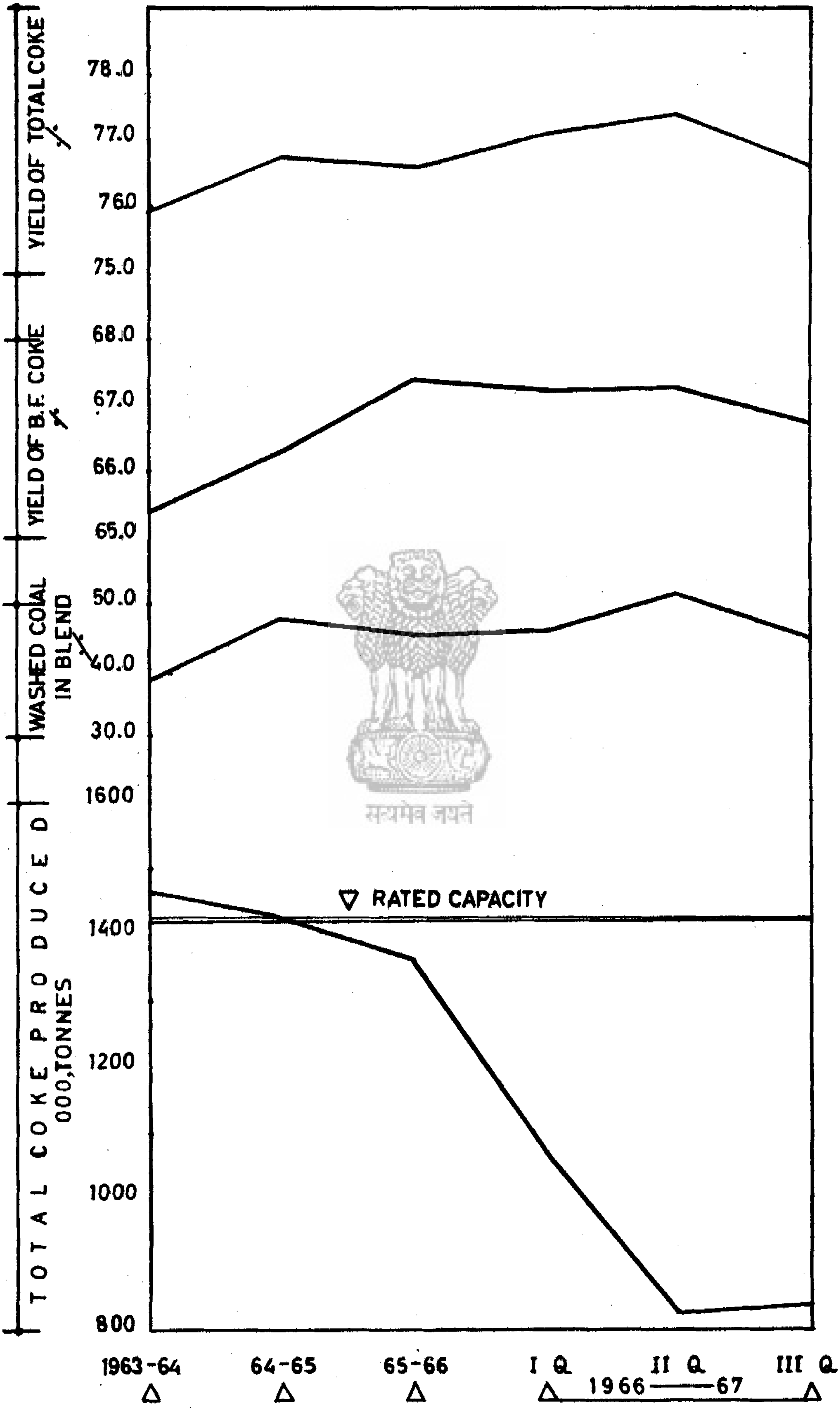
Performance of Coke Ovens

Sl. No.	Item Description	Unit	Standard or Design figures	1963-64	1964-65	1965-66	1966-67 I. Qr.	1966-67 II. Qr.	1966-67 III. Qr.
	Production								
1	Total coal charged	'000 t	1,898	1,900	1,848	1,763	347	267	272
2	Washed coal in Blend	%	47·4	38·15	47·04	45·49	46·3	51·5	44·9
3	Total coke produced	'000 t	1,424	1,457	1,418	1,350	267	206	208
4	% achievement on rated Capacity*	%		109	106	101	80·6	61·6	62·0
5	Yields of—Total Coke	%	75	76·7	76·7	76·6	77·0	77·4	76·6
	Blast Furnace Coke	%	87·7@	65·4	66·3	67·4	67·2	67·2	66·7
	Nut Coke	%		4·1	4·2	3·2	3·6	3·9	4·1
	Pearl & Breeze	%	12·3	6·4	6·3	6·0	6·2	6·4	5·7
6	(*a*) Gas make per tonne of coal	NM^3	310	259·40	257·08	277·50	287·02	314·0	335·1
	(*b*) Calorific value of C.O. Gas	K. Cal/M^3	4,500	4,760	4,759	4,595	4,397	3,987	3,944
7	Daily pushing rate	Nos.	288	271·5	271·8	274·8	214·8	159·4	158·3
8	Average Coking time (Gross)	Hrs. Mts.	19-30	N.A.	N.A.	20-26	23-47	27-14	26-15
9	Coal Input/oven pushed	t	18	19·19	18·66	17·63	17·57	18·20	18·61
10	Coke output/oven pushed	t	13·5	14·71	14·32	13·50	13·53	14·09	14·24
11	Analysis of coal Ash	%	16·5	19·01	18·41	18·64	18·30	18·33	17·63
	Volatile matter	%	28·25	25·47	25·47	25·79	25·76	25·30	26·13
	Moisture	%	5·0	5·07	4·97	5·01	4·33	5·10	4·60
12	Analysis of Coke Ash	%	22·23	24·94	24·14	24·41	24·8	24·5	23·8
	Volatile matter	%	0·6	0·96	0·88	0·88	0·73	0·63	0·63
	Moisture	%	2·0	4·42	3·45	3·49	4·30	3·96	4·33
	Micum Index +40 mm	%	75	77·5	78·1	77·7	78·6	78·7	78·9
	—10 mm	%	10·22	N.A.	N.A.	12·3	11·8	11·5	11·4
13	Input of Labour								
	(*i*) Men on roll (Mid Year)	Nos.	..	743	760	760	..	760	
	(*ii*) Overtime	Rs.	..	1,60,000	3,04,000	4,18,000	..	3,15,000	..
14	Consumption rates								
	(*i*) Coal per tonne of coke	Kg/t	1,333	1,30.,	1,30	1,306	1,299	-,296	1,307
	(*ii*) Heat consumption	10^6 K. Cal/t	..	0·73	0·86	0·78	0·84	1·02	0·99
15	Productivity-output/Man year	t.	..	1961·0	1865·8	1776·3	..	1195	..
16	Cost of B. Fce. Coke & Nut Coke/tonne	Rs./t.	..	57·03	62·22	68·22	70·74	81·63	82·21

*On wet basis.
@includes Nut coke also.


COKE OVENS
MOISTURE IN COKE %
5'0
4'0
3'0
V.M IN COKE %
1'0
0'9
0'8
0'7
0'6
ASH IN COKE %
25'0
24'0
23'0
MOISTURE IN COAL %
5'0
4'5
4'0
V.M IN COAL %
26'0
25'5
25'0
ASH IN COAL %
19'0
18'0
17'0
1963-64
64-65
65-66
I Q
II Q
III Q
1966-67
△
△
△

COKE OVENS


YIELD OF TOTAL COKE %
78.0
77.0
76.0
75.0
YIELD OF B.F. COKE %
68.0
67.0
66.0
65.0
WASHED COAL IN BLEND %
50.0
40.0
30.0
TOTAL COKE PRODUCED 000,TONNES
1600
1400
1200
1000
800
▽ RATED CAPACITY
1963-64
64-65
65-66
I Q.
II Q.
III Q.
1966——67

ANNEXURE VII-B

Performance of By-Product Plant

A. *Ammonium Sulphate and Sulphuric Acid Plants*

Sl. No.	Item Description	Unit	Standard or Design Figure	1963-64	1964-65	1965-66	1966-67		
							I Qr.	II Qr.	III. Qr.
1	(*a*) Production of sulphuric acid	t.	21,600	13,291	15,841	14,518	3,450	2,062	2,987
	(*b*) % achievement on rated capacity	%	..	62	73	67	64	38	55
2	(*a*) Production of ammonium sulphate	t.	21,276	15,085	18,092	15,706	2,973	2,121	2,177
	(*b*) % achievement on rated capacity	%	..	71	85	74	56	41	41
	(*c*) % yield sulphate to coal charged	%	1·1	0·78	0·97	0·91	0·86	0·75	0·76
3	Delays—Time-lost to available time	%	..	Not available					
4	Input of labour (*i*) No. of men on roll (mid-year)	Nos.	..	50	50	50		50	
	(*ii*) Overtime payments . .	Rs.	..	10,500	20,000	27,500		21,000	
5	*Productivity* Output of Ammonium Sulphate per man year . . .	t.	..	301·7	361·8	314·1		193·4	
6	Profit in production of sulphuric acid and ammonium sulphate	Rs.	..						
7	Cost of Am. Sulp./tonne . .	Rs.	..	150·46	139·76	186·80			
8	Cost of Sulphuric Acid/Tonne .	Rs.	..	96·69	100·50	137·66			

ANNEXURE VII-C

Performance of By-Product Plant

B. *Tar Plant*

Sl. No.	Item Description	Unit	Standard or Design figures	1963-64	1964-65	1965-66	1966-67 I. Qr.	1966-67 II. Qr.	1966-67 III. Qr.
1	(*a*) Crude Tar Production . .	t	57,000	56,451	50,811	53,539	10,293	7,024	7,675
	(*b*) % Achievement on rated capacity	%	..	98·9	89·1	93·8	72·2	49·2	53·8
	(*c*) % of crude Tar on coal charged	%	3·0	3·0	2·8	3·1	2·9	2·6	3·0
2	(*a*) Crude Tar processed . .	t	82,500	69,722	54,942	51,549	10,994	7,385	8,393
	(*b*) Production of Wood Preservative								
	Creosote	t	..	1,707	2,065	1,699	275	158	60
	Napthalene	t	2,280	1,486	1,689	1,667	186	245	296
	Pitch Creosote . . .	t	..	59,400	45,961	44,197	8,267	5,785	7,520
	Total Tar Products . .	t	..	62,593	49,715	47,563	8,728	6,188	7,876
	Yield % of Napthalene on crude tar	%	4·0 (Min.)	2·1	3·1	3·1	1·8	3·5	3·8
3	Loss of products . . .	%	..	Not available					
4	Delays-Time lost to available time	%	..	Not available					
5	Input of labour								
	(*i*) No. of men on roll (Mid. year)	Nos.	..	35	35	35		35	
	(*ii*) Overtime payments . .	Rs.	..	7,350	14,000	19,000		14,500	
6	*Productivity*								
	Tar Products/Man year . .	t	..	1,788·4	1,420·4	1,358·9		866·1	

ANNEXURE VII-D

Performance of By Product Plant

C. *Benzol Plant*

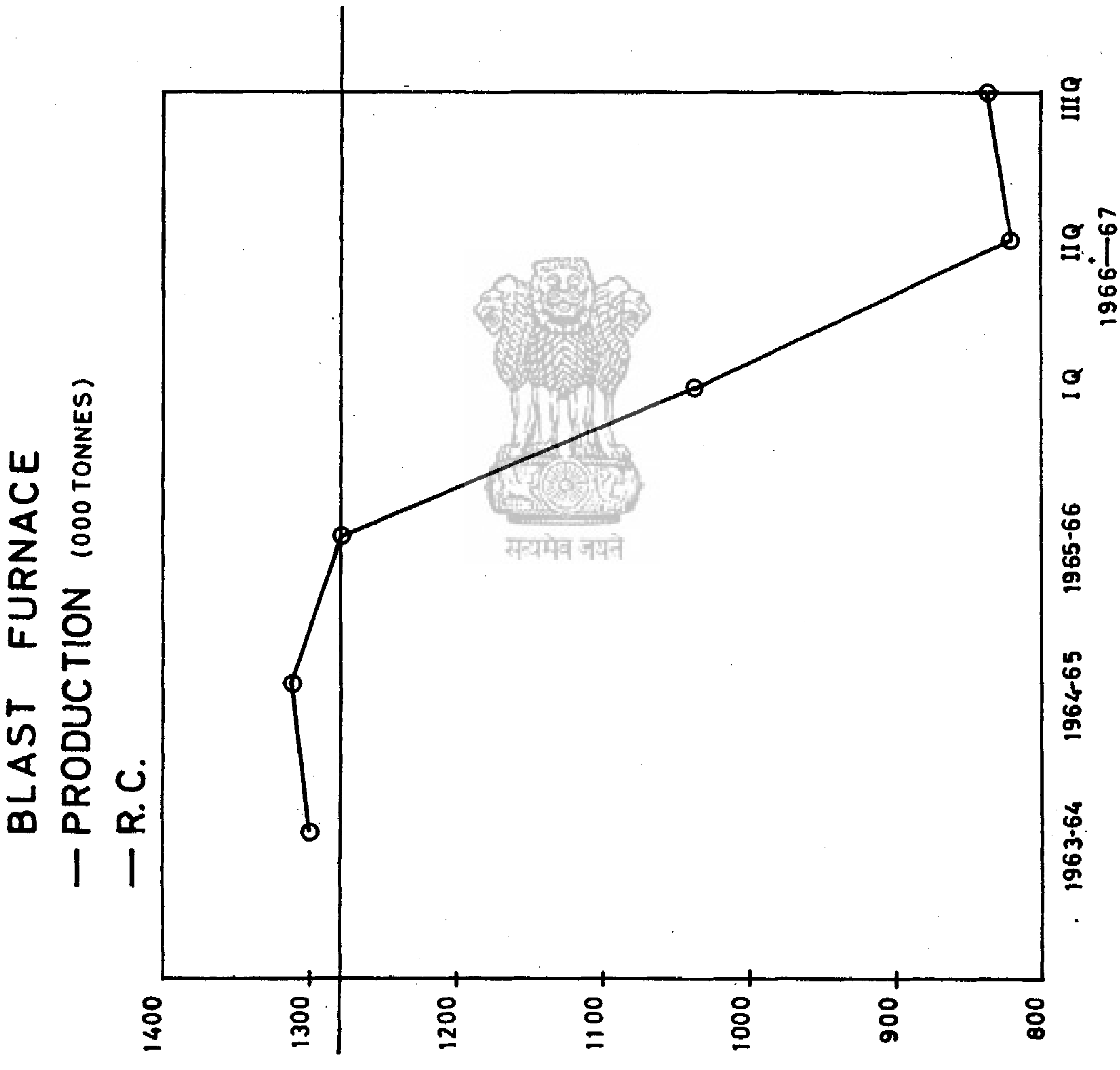
Sl. No.	Item Description	Unit	Standard or Design Figure	1963-64	1964-65	1965-66	1966-67		
							I. Qr.	II. Qr.	III. Qr.
1	(a) Crude Benzol production .	K.L.	14,724	6,184	4,751	9,220	1,516	874	1,702
	(b) % achievement on rated capacity	%	..	42	32	63	41	24	46
	(c) Yield % of crude Benzol on coal charged	%	0·84	0·3	0·2	0·5	0·4	0·3	0·6
2	(a) Crude Benzol processed .	K.L.	..	6,591	4,920	9,459	1,515	840	1,728
	(b) Production of Benzene . .	K.L.	10,000	4,263	3,072	5,685	1,147	385	882
	Yield % on Crude Benzol .	%	62	63·8	62·4	60·1	75·7	45·8	51·0
	(c) Production of Toluene . .	K.L.	1,452	483	337	597	97	50	81
	Yield % on Crude benzol .	%	8·8	7·3	6·8	6·3	6·3	5·9	4·7
	(d) Production of Xylene . .	K.L.	300	15	9	18	3	..	5
	Yield % on Crude Benzol .	%	1·9	0·23	0·18	0·19	0·19	..	0·29
	(e) Production of Solvent Naptha	K.L.	228	268	243	610	131	64	59
	Yield % on Crude Benzol .	%	1·5	4·1	4·9	6·4	8·6	7·3	3·5
3	Loss of products	%	..	24·6	25·4	26·9	9·00	40·6	40·5
4	Delays—Time lost to available time	%	..	Not available					
5	*Input of labour*								
	(i) No. of men on roll . .	Nos.	..	50	50	50		50	
	(ii) Overtime payments . .	Rs.	..	10,500	20,000	27,500		21,000	
6	*Productivity*								
	Benzol products/man yr. . .	K.L.	..	99·4	73·2	138·2		77·4	

ANNEXURE VIII-A

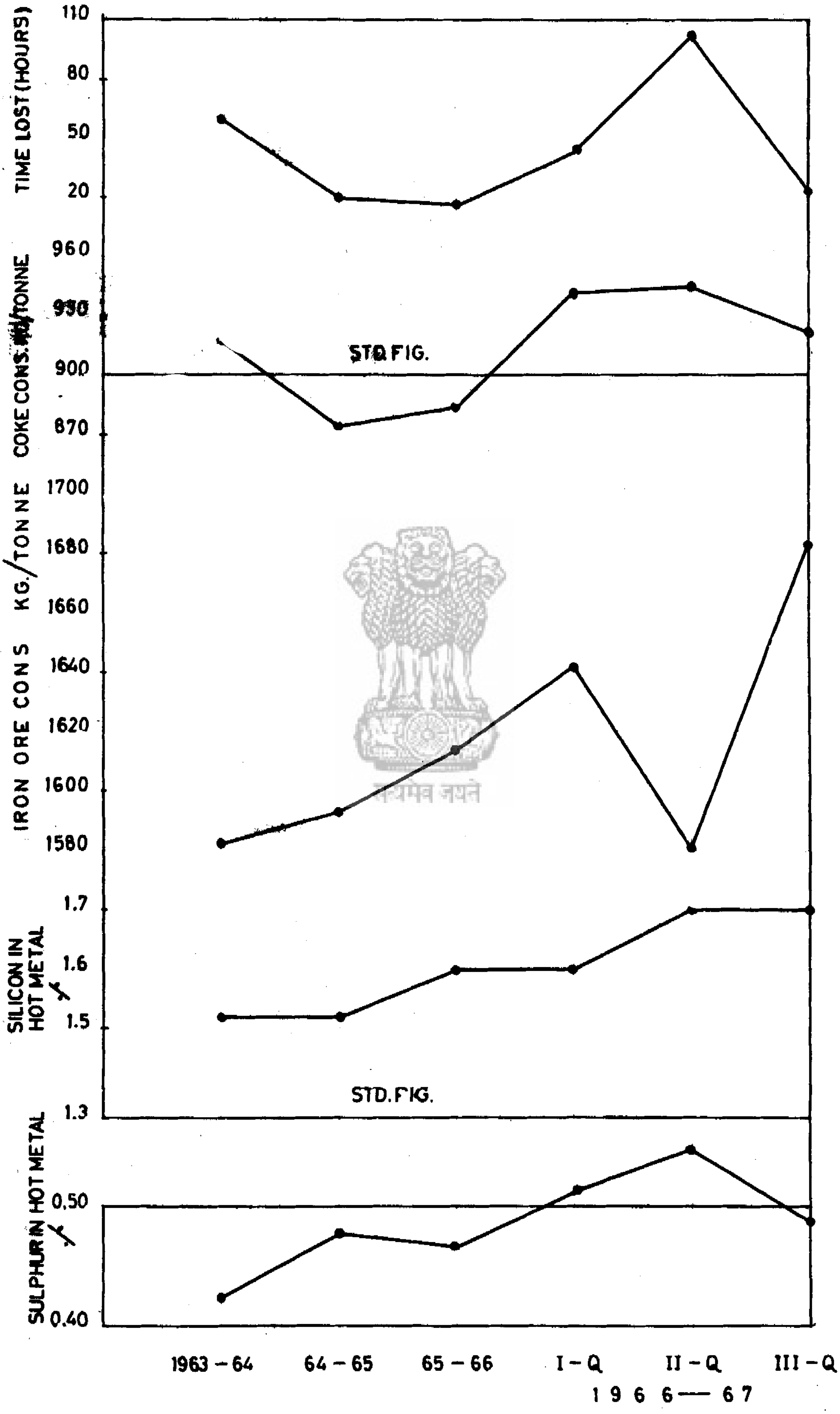
Performance of Blast Furnaces

Sl. No.	Item Description	Unit	Standard or Design Figure	1963-64	1964-65	1965-66	1966-67			Remarks
							I. Qr.	II. Qr.	III. Qr.	
	A. *Outputs*									
1.	Production of Hot Metal	'000 t.	1284	1302	1313	1280	260	205	208	Fce. No. I was blown out for relining on 9th Sept. 1966.
2.	% of Foundry Iron in I .	%	..	N.A.	62	68	75	33	79	
3.	% of off grade . .	%	..	10·9	25·7	15·3	..	Not available.		
4.	% Achievement of rated capacity . . .	%	..	101	102	100	81	69	97	
5.	Si content in H. Metal .	%	1·3-1·35	1·49	1·52	1·56	1 62	1·71	1·66	
6.	'S' content in H. Metal .	%	0·05Max.	0·042	0·048	0·047	0·051	0·055	0·049	
7.	Calorific value of Blast furnace gas. . .	K/Cal/M3	840	904	891	892	877	876	868	
8.	Iron Yield	%	..	96·3	93·2	91·2	90·6	89·2	86·1	
	B. *Inputs*									
9.	(i) Men on Roll (Middle of the year) . .	Nos.	..	872	941	1050	960	(for first three quarters)		
	(*ii*) Overtime payments	'000 Rs.	..	64	136	259	203	(for the whole year)		
	(*iii*) Consumption rates per tonne of H. Metal:—									
	(*a*) Iron Ore . .	Kg/t.	1765	1582	1592	1634	1643	1580	1683	
	(*b*) Coke . . .	Kg/t.	900	905	878	885	950	946	918	Fce. oil injection was also used for few months in Furnaces II & II
	(*c*) Fluxes (Limestone & Dolomite) . .	Kg/t.	326	450	37	380	404	377	360@	
	C. *Other Characteristics*									
10.	Flue dust loss . .	Kg/t.	54	118	119	183	174	111	219	@Limestone only.
11.	Slag rate . . .	Kg/t.	515	588	498	487	479	508	463	
12.	Av. Blast Temp. . .	oC.	800	712	763	781	727	737	745	
13.	Av. Blast Pressure . .	Kg/Cm2	1·5 gauge	N.A.	1·15	1·24	1·09	0·97	1·25	
14.	Burden Ratio (Flux Ore/coke) . . .	Ratio	2·32	1·75	1·81	1·82	1·73	1·63	1·83	
15.	Breeze Screened . .	%	..	..	7·09	6·8	6·4	6·4	6·3	
16.	Time lost (off Blast) .	Av. Hrs. Mts.	..	58—20	26—35	22—45	29—12	107—17	27—04	
	D. *Productivity*									
17.	Output/Man year (incl. Overtime etc) . .	T	..	1493·1	1395·3	1219·0	1111·0	(for first three quarters)		
18.	Cost of Hot Metal/tonne	Rs.	..	134·43	134·27	152·67	157·16	172·92	173·73	

ANNEX—VIII A


BLAST FURNACE
— PRODUCTION (000 TONNES)
— R.C.
1400
1300
1200
1100
1000
900
800
1963-64
1964-65
1965-66
I Q
II Q
III Q
1966—67

BLAST FURNACE



ANNEXURE IX-A

Performance of Steel Melting Shop

Sl. No.	Item Description	Unit	Standard or Design Figure	1963-64	1964-65	1965-66	1966-67		
							I Qr.	II. Qr.	III. Qr.
1.	A. *Output*								
	(*a*) Production (Gross) . . .	'000 t.	..	989	1020	1015	198	164	185
	(*b*) Production (rollable) . . .	%	1016	972	1006	1001	196	162	181
	(*c*) Achievement on rated capacity .	%	..	96	99	99	77	64	71
2.	Ingot Yield (Net)	%	87-88 % for top-pouring 84-85% for bottom pouring	87·9	86·3	85·6	85·7	83·7	86·01
	B. *In-puts.*								
3.	(*a*) Men on roll (mid year) . .	Nos.	..	1012	1155	1236		1104	
	(*b*) Overtime payments . . .	Rs.	..	2,35,000	3,64,000	5,41,000		2,07,000	
	Consumption rates								
4.	(*a*) Hot Metal	Kg/t.	762	843	843	854	832	819	819
	(*b*) Scrap	Kg/t.	217	221	224	185	205	234	218
	(*c*) Iron Ore	Kg/t.	87	153	158	165	160	134	143
	(*d*) Limestone & dolomite . .	Kg/t.	71	77	79	81	68	83	87
	(*e*) Refractory	Kg/t.	..	46·7	39·0	33·4	28·2*	35·8*	35·9*
5.	(*a*) Heat Input/t	10^6K. Cal.	1·00	1·52	1·60	1·56	1·55	1·48	1·60
	(*b*) Thermal ratio (PC:gas) . .	rated	30·70	36·64	29·71	31·69	37·63	47·53	60·40+
	C. *Other Characteristics.*								
6.	Average tap to tap time . . .			12—0	12—0	11—36	12—26	12—02	12—02
	(*i*) 200 T. fcs.	Hrs. Mts.	10 to 10-30	12—07	12—15	11—48	12—22	12—10	11—02
	(*ii*) 100 T. fce.	Hrs. Mts.	8 to 8-30	11-18	10—14	10—18	12—40	11—08	10—36
7.	*Furnace availability*	for Silica roof							
	(*i*) 200 T. fce.	%	82—84%	89·5	91·8	87·0	71·5	58·3	67·0
	(*ii*) 100 T. fce.	%	83—85%	90·6	93·7	88·2	74·5	75·3	75·2
	D. *Productivity.*								
8.	Production/jr./fce.								
	(*a*) 200 T. fce.	t.	18—19	16·7	16·5	17·2	16·7	15·1	15·2
	(*b*) 100 T. fce.	t.	11—12	7·8	9·8	10·0	7·9	9·0	9·5
9.	Rollable Production/man years. . .	t	..	960·5	871·0	810·5		649	
10.	Cost of Ingot/tonne	Rs.	..	216·04	227·43	251·72	264·38	302·85	360·31

*Based on gross production

+Furnace Oil is also included.

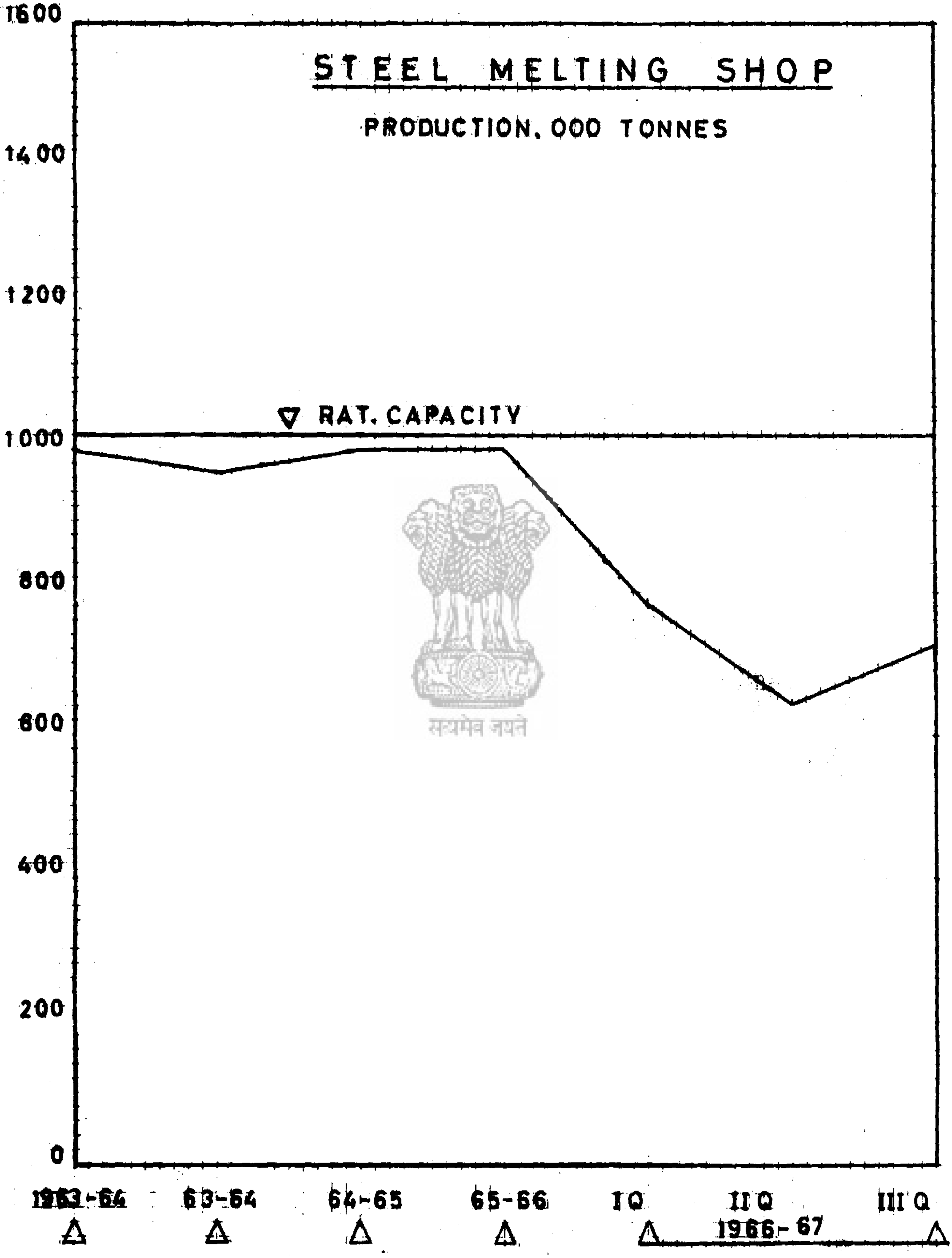
ANNEXURE X-A.

Performance of Rolling Mills.

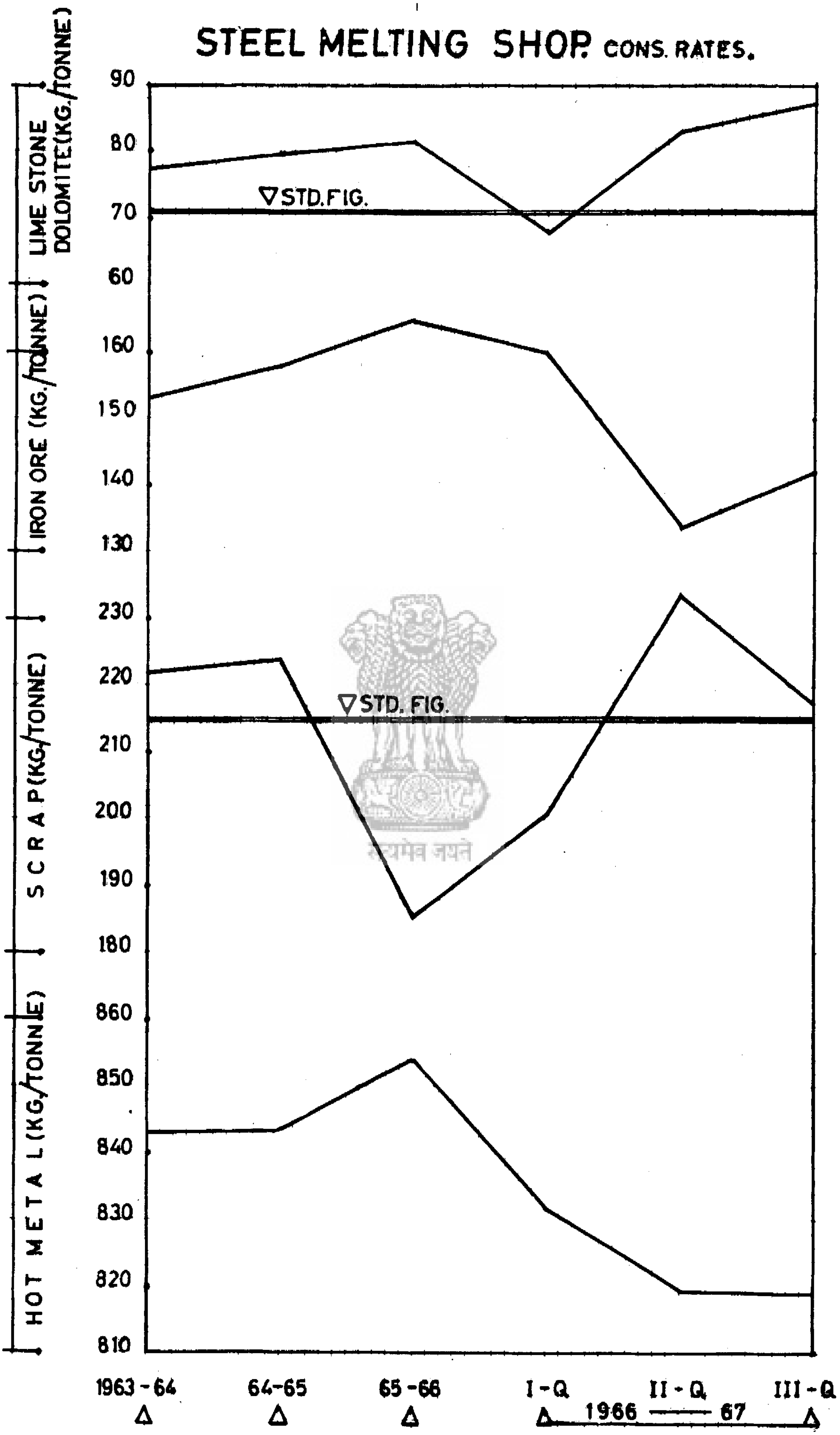
A. *Soaking Pits and Blooming Mills*

Sl. No.	Item Description	Unit	Design figure	1963-64	1964-65	1965-66	1966-67		
							I. Qr.	II. Qr.	III. Qr.
	Soaking Pits.								
1	Charge								
	(*i*) Hot	%	80	86·94*	88·86	86·76	75·68	77·15	74·92
	(*ii*) Cold	%	20	13·06*	11·14	13·25	24·32	22·85	25·08
	Production								
2	(*i*) Total	t	941,000	908,708	909,244	905,672	201,112	1,40,746	192,403
	(*ii*) % of rated capacity	%	..	96·4	96·6	96·3	89·7	62·9	85·7
3	Heat Consumption	10^6K. Cal/t	..	0·30	0·31	0·35	0·45	0·51	0.50
4	Pit availability/day	Nos.	..	N.A.	9·29	10·06	12·88	9·85	11·41
	Blooming Mills								
5	Total ingots rolled	'000 t		909	909	906	201	141	192
6	Production of blooms & slabs	'000 t	859	817	820	822	177	125	171
7	% achievement on rated capacity	%	..	95·1	95.5	95·8	81·9	57·9	79·2
8	Yield	%	80	89·9	90·2	90·7	87·9	89·1	88·5
9	*Delays*								
	(*i*) Time lost to available time	%	..	N.A.	46·5	46·7	51·6	59·1	52·8
	(*ii*) Operation delays	%	..	..	36·3	28·9	35·5	44·5	42·4
	(*iii*) Mech. delays	%	..	..	9·5	14·7	13·7	12·2	8·8
	(*iv*) Elec. delays	%	..	..	1·8	3·1	2·2	2·3	1·7
10	*Input of labour*								
	(*i*) Men on roll (mid. of year)	Nos.	..	355	392	412		333	
	(*ii*) Overtime	Rs.	..	3,41,000	3,91,000	4,83,000		3,09,000	
11	*Consumption rates*								
	(*i*) Heat consumption	10^6K. cal/t	..	0·33	0·34	0·38	0·45	0·50	0·49
	(*ii*) Power consumption	KWH/t	..	38·2	40·9	41·3	32·8	48·2	44·2
12	*Productivity*								
	Output/Man year	t	..	2,301.5	2,091·7	1,994·8		1858	
13	Cost/tonne of product	Rs	..	244·67	261.21	288·58	313·79	366·10	360·31

£for one quarter only.


STEEL MELTING SHOP
PRODUCTION, 000 TONNES
RAT. CAPACITY
1600
1400
1200
1000
800
600
400
200
0
1963-64
63-64
64-65
65-66
I Q
II Q
III Q
1966-67

STEEL MELTING SHOP CONS. RATES.



ANNEXURE K-B

Performance on Rolling Mills *Productivity*

B. *Billet Mill*

Sl. No.	Item Description	Unit	Standard or design figure	1963-64	1964-65	1965-66	1966-67 I Qr.	1966-67 II Qr	1966-67 III Qr.
1	Blooms & slabs charged	'000 T	..	540	528	518	123	86	115
2	Production of Billets and bars	'000 T	537	528	514	496	117	85	108
3	Production as % of rated capacity	%	..	98·3	95·7	92·4	87·4	63·0	80·0
4	Yield	%	94·5	94·3	95·6	95·9	95·6	96·0	95·3
5	*Delays:*								
	(*i*) Time lost to available time	%	..	..	64·3	67·1	67·3	72·5	69·6
	(*ii*) Operational delays	%	..	..	62·1	63·8	61.2	56.8	66·6
	(*iii*) Mech. Delays	%	..	..	1·6	2.5	5·5	4·8	2·5
	(*iv*) Elec. Delays	%	..	..	0·6	0·8	0·6	0·5	0·4
6	Power Consumption	KWH/t	..	27·9	27·1	29·6	28·5	31·4	30·3
7	*Input of labour*								
	(*i*) Men on roll	Nos.	..	229	239	226		198	
	(*ii*) Overtime	Rs.	..	1,84,000	1,96,000	2,51,000		2,04,000	
	Productivity								
	Output/Man year	T	..	2,305·7	2,148·8	2,192·5		2085	
9	Cost/tonne of product	Rs./T	..	264·74	282·69	307·60	340·40	397·77	390·00

ANNEXURE X-C

Performance of Rolling Mills

C. *Section Mills*

Sl. No.	Item Description	Unit	Standard or design figure	1963-64	1964-65	1965-66	1966-67 I Qr.	1966-67 II Qr.	1966-67 III Qr.
1	Blooms charged	'000 T	..	226	230	217	42	33	41
2	Total production	'000 T	203	206	209	198	38	30	37
3	% achievement on rated capacity	%	..	101·5	102·9	97·4	75·4	59·8	73·5
4	Yield	%	89%	91·2	90·0	91·3	92.0	91·2	92·0
5	*Delays*:								
	(*i*) Time lost to available time	%	..	N.A.	33·8	37·2	42·8	40·3	38·53
	(*ii*) Operational Delays	%	..	„	26·3	28·8	35·1	36·9	32·7
	(*ii*) Mech. Delays	%	..	„	5·8	7·1	6.2	4·4	5·1
	(*iv*) Elec. Delays	%	..	„	1·8	1·3	1·4	0·7	0·7
6	*Input of labour*:								
	(*i*) Men on roll	Nos.	..	478	551	615		549	
	(*ii*) Overtime	Rs.	..	2,83,000	3,76,000	6,43,000		2,33,000	
7	*Consumption rates*:								
	(*i*) Heat Consumption	10^6K. Cal/T	..	0·61	0·69	0·81	1·03	1·02	0·95
	(*ii*) Power consumption	Kwh/T	..	84·8	84·3	95·4	106·86	116·3	103·3
8	*Productivity**								
	Output/Man year	T	..	431·0	379·3	321·7		255	
9	Cost/tonne of product	Rs.	..	308·04	346·18	385·22			

ANNEXURE X-D

Performance of Rolling Mills

D. *Merchant Mill*

Sl. No	Item Description	Unit	Standard or design figures	1963-64	1964-65	1965-66	1966-67		
							I Qr.	II Qr.	III Qr.
1	Billets charged	'000 T	..	213	244	268	49	46	58
2	Total production	'000 T	244	200	243	250	45	43	54
3	% achievement on rated capacity	%	..	82	100	102	74	71	89
4	Yield (from Billets)	%	94·2	94·1	94·0	93·6	92·3	92·8	93·7
5	Production/shift	T	..	205·1	245·45	261·2	178·9	211·2	231·70
6	*Delays*:								
	(*i*) Time lost to available time	%	..	N.A.	39·2	37·5	48·7	40·3	36·5
	(*ii*) Operational Delays	%	..	„	31·8	31·7	41·4	34·6	33·2
	(*iii*) Mech. Delays	%	..	„	5·7	4·5	6·3	[illegible]	4·3
	(*iv*) Elec. Delays	%	..	„	1·5	1·3	1·3	0·7	1·1
7	*Input of labour*:								
	(*i*) Men on roll	Nos.	..	454	486	500	435		
	(*ii*) Overtime	Rs.	..	1,65,000	2,14,000	3,23,000	1,62,000		
8	*Consumption rates*:								
	(*i*) Heat consumption	10^6K Cal/t	..	0·42	0·42	0·48	0·57	0·52	0·45
	(*ii*) Power consumption	Kwh/t	..	78·2	67·8	65·2	81·40	100·69	72·11
9	*Productivity*:								
	Output/man year	t.	..	440·8	500·0	500·7	434·1		
10	Cost/tonne of product	Rs.	..	307·89	330·04	356·04			

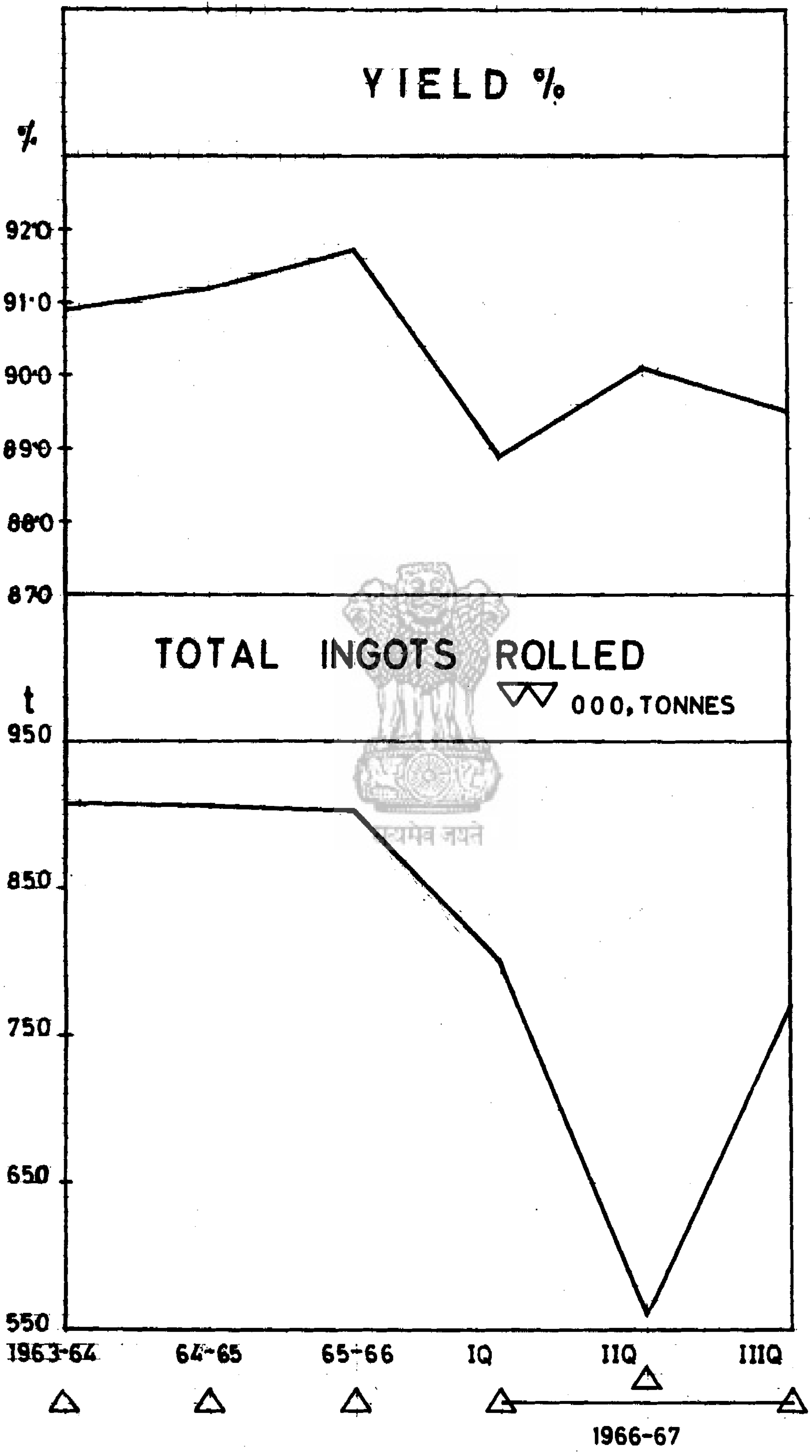
ANNEXURE X-E

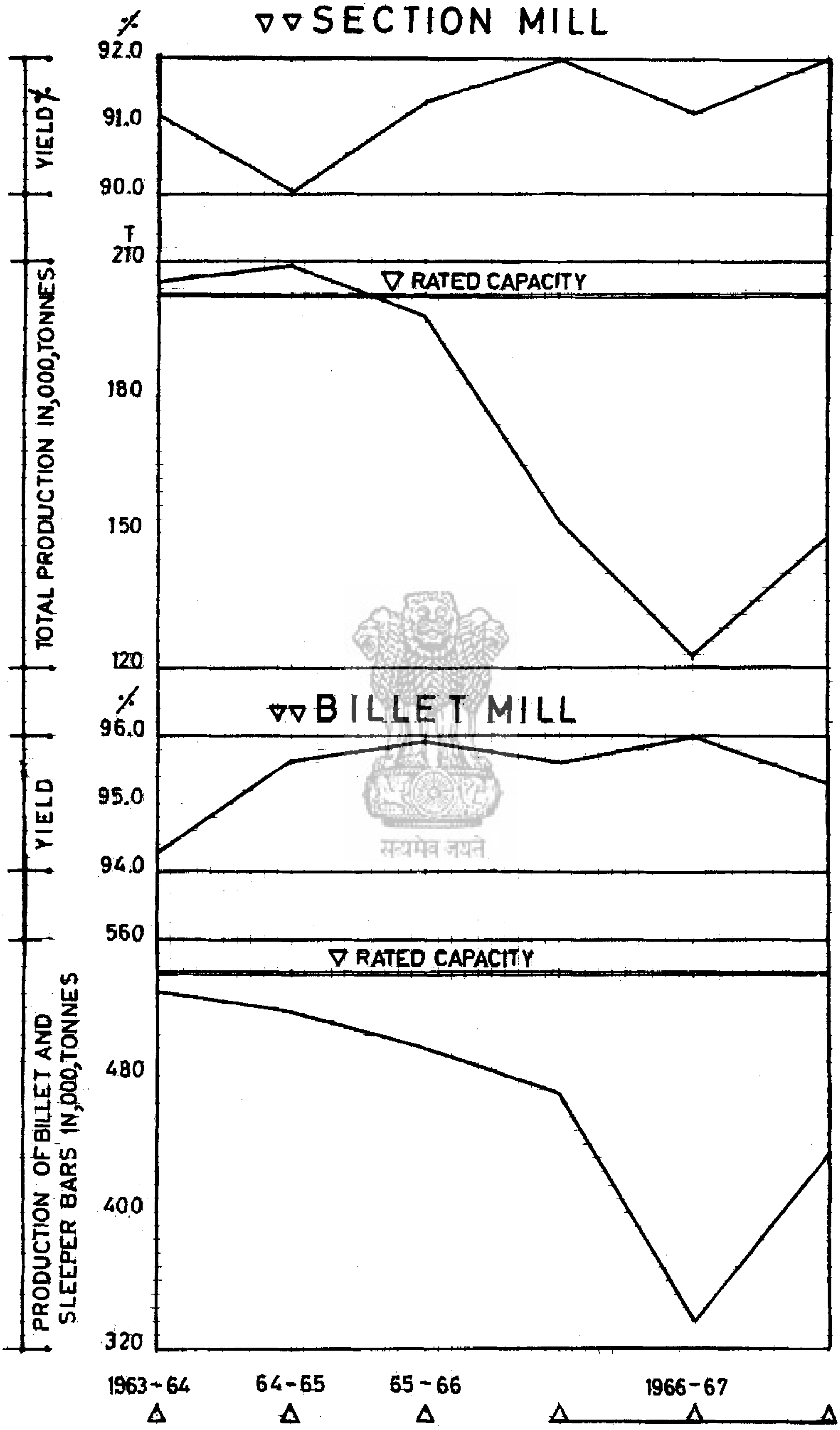
Performance of Rolling Mills

E. *Fish Plate Plant*

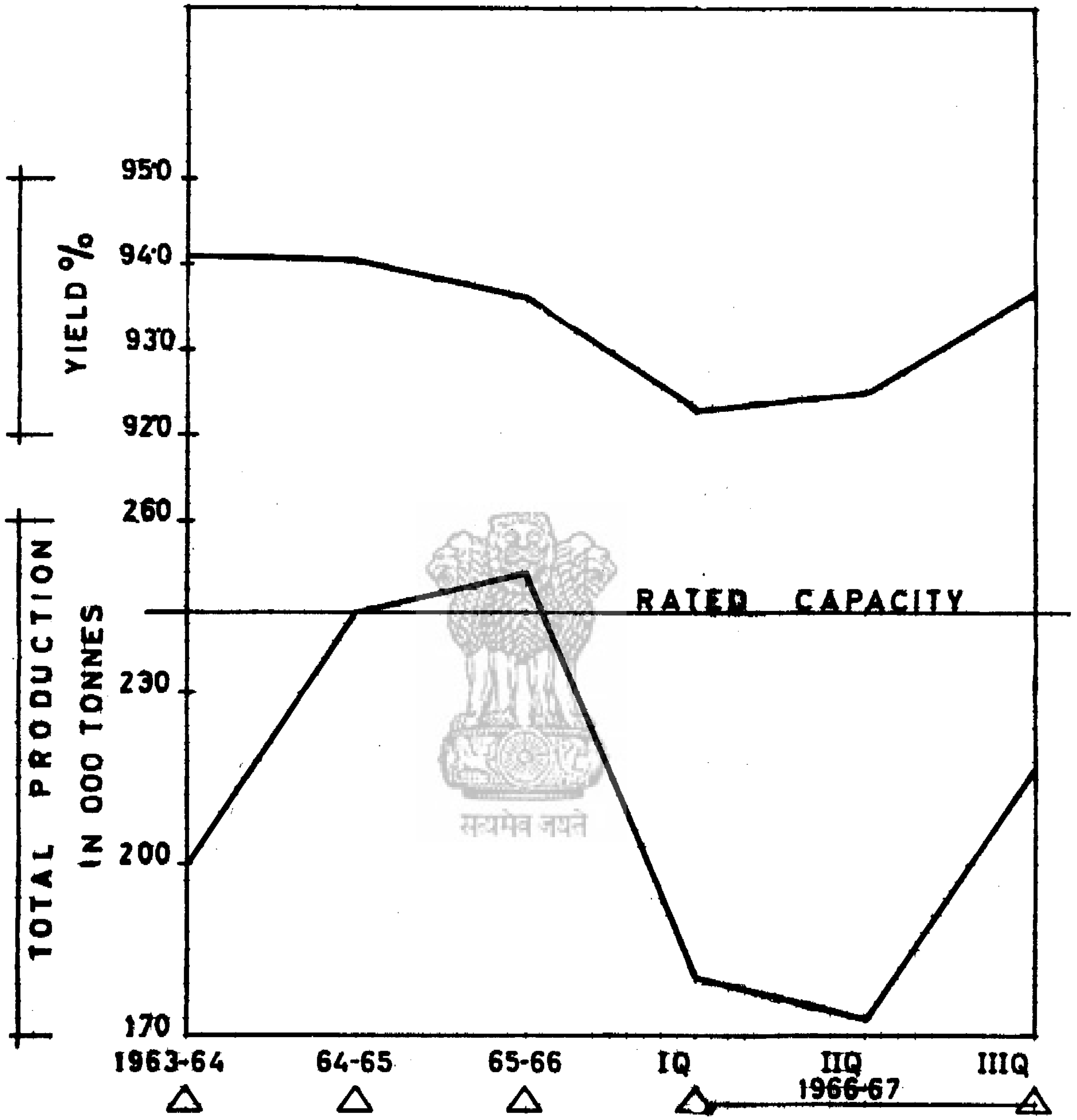
Sl. No.	Item Description	Unit	Standard or design figures	1963-64	1964-65	1965-66	1966-67 I Qr.	1966-67 II Qr.	1966-67 III Qr.
1	Fish Plate Bar charged for cutting	T	12,800	..	723	2,493	694	788	1,034
2	Finished fish plates produced	T	11,000	..	633	2,263	641	719	926
3	% achieved on rated capacity	%	..	..	5·8	20·6	23·3	26·1	33·7
4	Yield	%	86						
5	*Delays*:								
	(*i*) Time lost to available time	%							
	(*ii*) Operational Delays	%							
	(*iii*) Mechanical Delays	%							
	(*iv*) Elec. Delays	%							
6	*Input of labour*:								
	(*i*) Men on roll	Nos.			30	30		30	
	(*ii*) Overtime payments	Rs.				2,000		2,500	
7	*Productivity*:								
	Output/man year	T	..	..	21·1	75·4		101·94	
8	Cost/tonne of fish plate	Rs.	..	..	573·92	597·00	717·96	775·58	729·57

BLOOMING MILL




▽▽SECTION MILL
%
92.0
91.0
90.0
YIELD %
T
210
180
150
120
TOTAL PRODUCTION IN,000,TONNES
▽ RATED CAPACITY
▽▽BILLET MILL
%
96.0
95.0
94.0
YIELD
560
480
400
320
PRODUCTION OF BILLET AND SLEEPER BARS IN,000,TONNES
▽ RATED CAPACITY
1963-64
64-65
65-66
1966-67

MERCHANT MILL



ANNEXURE XI-A

Performance of Wheel & Axle Plant

(A) *Wheel Plant*

Sl. No.	Item Description	Unit	Standard or design figures	1963-64	1964-65	1965-66	1966-67		
							I Qr.	II Qr.	III Qr.
1	Production of finished wheels .	'000 t	40	20	23	23	3	3	4
2	% achievement on rated capacity .	%	..	50	57·5	57·5	30·0	30·0	40·0
3	Yield on finished wheel from ingot	%	51	43·4	46·4	45·4	51·4	50·2	56·9
4	Production/shift . . .	T.	..	N.A.	62·7	44·4	28·8	31·2	36·7
5	*Delays*:								
	(*i*) Time lost to available time .	%	..	,,	13·2	23·7	45·4	43·5	33·1
	(*ii*) Operational Delays] . .	%	..	,,	5·7	17·2	40·3	32·1	21·0
	(*iii*) Mechanical Delays . .	%	..	,,	5·0	4·6	3·5	9·4	11·8
	(*iv*) Electrical Delays . .	%	..	,,	1·1	1·9	1·5	2·0	1·7
6	*Input of labour* :								
	(*i*) Men on roll* . . .	Nos.	..	880	1,014	1,087		1,010	
	(*ii*) Overtime payments . .	Rs.	..	1,48,000	4,72,000	5,35,000		2,73,000	
7	*Consumption rates* . . .	10^6K. Cal/t	..	2·0**	1·6**	1·9**	3·2	2·8	1·8
	(*i*) Heat consupmtion	10 K.Cal/T	..	0·61	0·69	0.81	1.03	1·02	0.95
	(*ii*) Power consumption . .	Kwh/t	..	404·6**	342·8**	360·3**	216·7**	182·6**	162·9**
8	*Productivity*—Total Wheel & Axles. Output/Man year . . .	T.	..	35·7	34·2	31·1		21·1	
9	Cost of machined wheel/tonne .	Rs.	..	764·84	743·82	907·40	884·09	1275·96	1145·91

*includes Axle Plant.

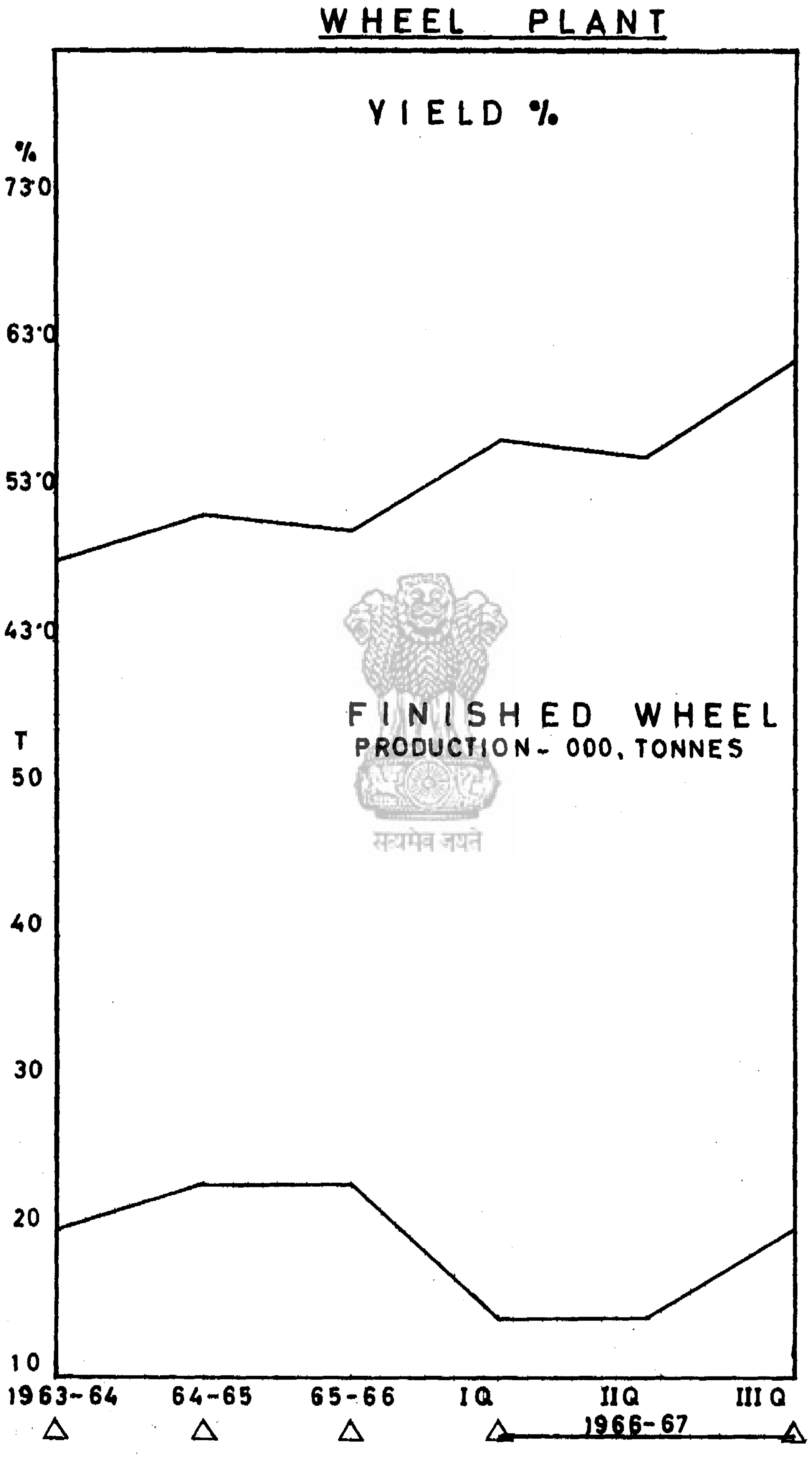
**Includes consumption rates of Axle Plant also.

ANNEXURE XI-B

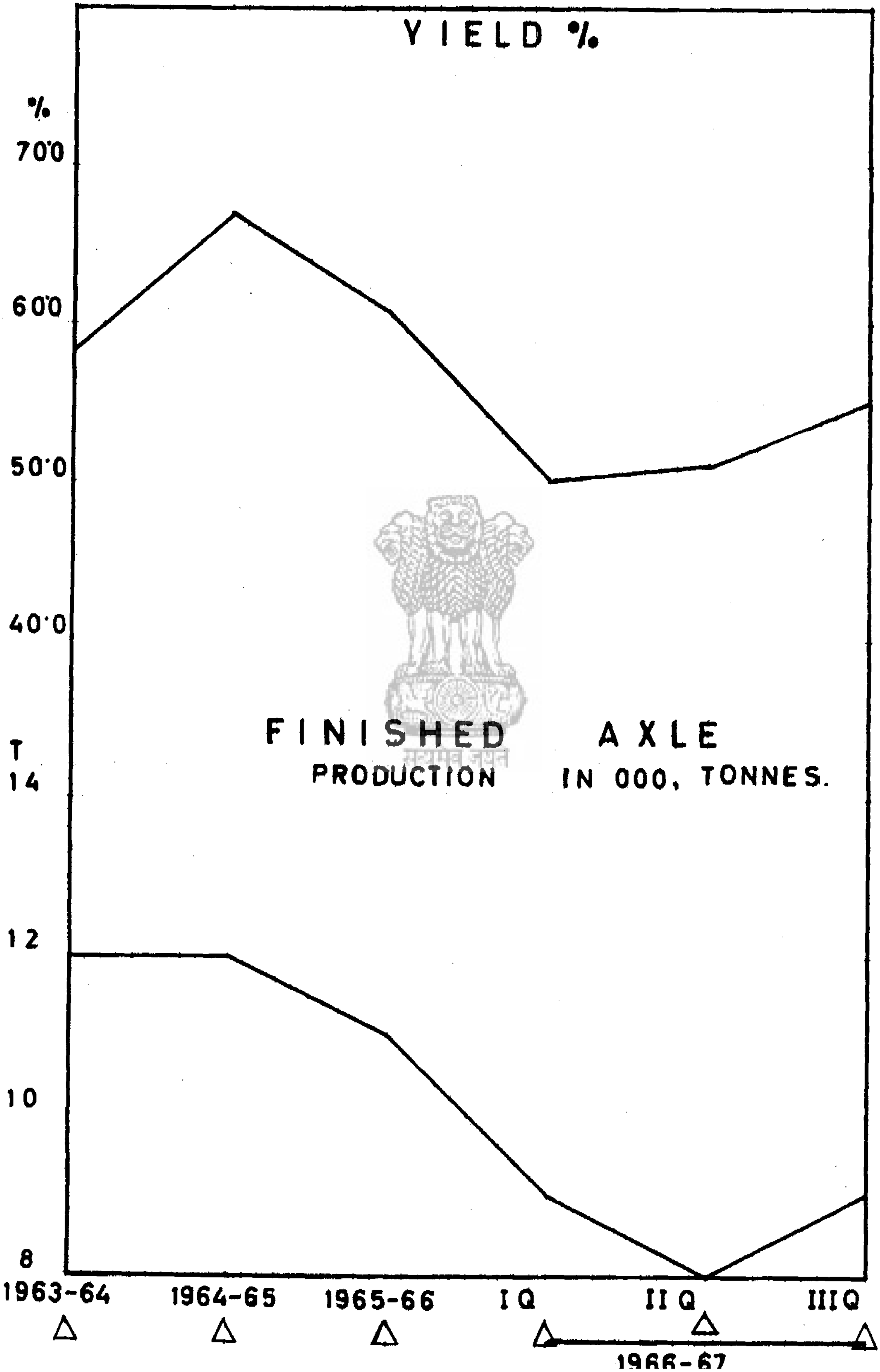
Performance of Wheel & Axle Plant

(B) *Axle Plant*

Sl. No.	Item Description	Unit	Standard or design figures	1963-64	1964-65	1965-66	1966-67 I Qr.	1966-67 II Qr.	1966-67 III Qr.	Remarks
1	Production of finished axles	'000 T	17	12	13	11	2	2	2	
2	% achievement on rated capacity	%	..	70·0	70·0	64·7	47·1	47·1	47·1	
3	Yield of finished axle from bloom	%	66	58·0	66·5	60·4	50·1	50·5	54·8	
4	Production per shift .	T	..	..	4·6	4·4	3·3	5·1	4·5	
5	*Delays*:									
	(*i*) Time lost to available time	%	..	..	14·7	19·7	31·6	34·5	23·8	
	(*ii*) Operational delays	%	..	..	11·7	14·0	19·8	19·3	13·5	
	(*iii*) Mechanical delays	%	..	..	2·3	4·2	9·7	9·8	7·5	
	(*iv*) Elec. delays . .	%	..	..	0·5	1·5	2·0	4·1	3·9	
6	*Input of labour*:									
	(*i*) Men on roll .	Nos.	INCLUDED IN WHEEL PLANT							
	(*ii*) Overtime payments	Rs.								
7	*Consumption rates*:									
	(*i*) Heat consumption	10^6K.Cal/t	..	*	*	*	1·9	1·6	1·5	*Rates are given in wheel Plant.
	(*ii*) Power consumption	Kw-h/t	..	*	*	*	*	*	*	
8	*Productivity*:									
	Output/Man year .	T	..							
9	Cost of machined Axle/tonne	Rs.	..	497·97	770·75	983·98	955·44	1557·84	1340·63	


WHEEL PLANT
YIELD %
%
73·0
63·0
53·0
43·0
FINISHED WHEEL
PRODUCTION - 000, TONNES
T
50
40
30
20
10
1963-64
64-65
65-66
I Q
II Q
III Q
1966-67
सत्यमेव जयते

AXLE PLANT


YIELD %
%
70.0
60.0
50.0
40.0
FINISHED AXLE
PRODUCTION IN 000, TONNES.
T
14
12
10
8
1963-64
1964-65
1965-66
I Q
II Q
III Q
1966-67

ANNEXURE XI-C

Performance of Wheel & Axle Plant

Analysis of losses at various stages

Sl. No.	Item Description	1963-64	1964-65	1965-66	1966-67			Remarks
					I Qr.	II Qr.	III Qr.	
	A. *Wheels*							
a.	Top Discard			26·33	19·22	20·55	22·52	A large portion of this is due to steel defects leading to scrap at forging.
b.	Press Rejection			4·73	6·28	7·64	7·92	
c.	Scale loss			3·58	4·26	3·96	3·88	
d.	Drop test loss			0·78	1·18	0·96	0·77	
e.	Machining loss			8·79	8·17	8·23	6·67	
f.	Metallurgical Rejection . . .			10·10	7·06	7·45	8·51	
	Total losses			54·31	46·17	48·79	50·27	
	Yield on Ingot . . . . . (Standard yield 51%)			45·69	53·86	50·82	49·71	
	B. *Axles*							
a.	Scarfing loss			1·00	1·00	1·00	1·00	
b.	Scale loss			1·73	1·74	1·82	1·74	
c.	End cutting			5·55	5·67	5·61	5·66	
d.	Machining loss			19·22	21·65	21·68	21·52	
e.	Rejection at M/c stage . . .			8·45	10·28	15·11	10·18	
f.	Drop test loss			1·85	1·92	2·62	1·92	
g.	Scrap at forging stage . . .			2·89	0·73	0·51	0·96	
	Total losses			40·69	42·99	48·35	42·98	
	Yield on bloom . . . . . (standard yield 66%)			59·31	56·98	51·77	56·80	

ANNEXURE XI-D

Performance of Rolling Mills

D. *Sleeper Plant*

Sl. No.	Item Description	Unit	Standard or design figures	1963-64	1964-65	1965-66	1966-67 I Qr.	1966-67 II Qr.	1966-67 III Qr.	Remarks
1	Sleeper Bars charged	'000 T	..	43	70	70	14	13	15	
2	Production of sleepers	'000 T	61(*) 75(**)	41	68	69	14	12	15	(*) based on 2 shifts. based on 3 shifts.
3	% achievement on rated capacity	%	..	67·4*	111·2*	91·5**	74·7**	64·9**	79·9**	
4	Yield	%	93·7	95·5	96·5	98·2	96·6	95·5	97·2	
5	*Delays*:									
	(*i*) Time lost to available time	%	..	..	20·6	28·0	47·4	35·3	20·72	
	(*ii*) Operational delays	%	..	..	5·5	8·7	30·4	20·3	11·1	
	(*iii*) Mechanical delays	%	..	..	14·7	18·4	16·5	14·6	9·2	
	(*iv*) Electrical delays	%	..	..	0·4	0·9	0·5	0·3	0·4	
6	*Input of labour*:									
	(*i*) Men on roll	Nos.	..	216	228	276		240		
	(*ii*) Overtime payments	Rs.	..	97,000	1,36,000	2,44,000]		1,69,000]		
7	*Consumption rates*:									
	(*i*) Heat consumption	10^6K.Cal./t	..	0·53	0·31	0·35	0·51	0·44	0·38	
	(*ii*) Power	Kwh/t	..	33·3	24·0	20·1	21·4	30·2	26·1	
8	*Productivity*:									
	Output/Man year	T	..	190·2	297·5	248·8		227·6		
9	Cost/tonne of product	Rs.	..	311·09	333·51	359·99	408·29	493·32	460·09	

ANNEXURE XI-E

Analysis of rejection of sleepers

Causes of Rejection	1964-65	1965-66	1966-67 (upto January '67)	Remarks
Operation	7·56	10·45	13·14	About 75·80% of these rejections are due to twist, tilt, bad section, short spacing of holes out etc.
Rolling	0·23	0·17	0·66	
Metallurgical	1·63	0·39	2·12	
Total % Rejection	9·42	11·51	15·92	

ANNEXURE XII-A

Performance of Central Engg. & Maintenance Shops

Sl. No.	Item Description	Unit	Standard or design figures	1963-64	1964-65	1965-66	1966-67		
							I Qr.	II Qr.	III Qr.
1	(*a*) Production of Machine Shop .	T	2,040	2,972	3,346	4,076	782	767	909
	(*b*) % achievement on rated capacity	%	..	145·7	164	199·8		160·6	
	(*c*) Men on roll	Nos.	..	174	174	174		174	
	(*d*) Productivity—output/Man year	T	..	17	19·2	23·4		18·8	
2	(*a*) Production of structural shop .	T	2,040	1,735	1,644	1,861	385	515	453
	(*b*) % achievement on rated capacity	%	..	85	80·59	91·23		88·4	
	(*c*) Men on roll . . .	Nos.	..	153	153	153		153	
	(*d*) Productivity—output/Man year	T	..	11·3	10·7	12·2		11·6	
3	(*a*) Production of Forge Shop .	T	..	345·24	392	455	114	104	118
	(*b*) % achievement on rated capacity	%	..	..	..	..		..	
	(*c*) Men on roll	Nos.	..	64	64	64		64	
	(*d*) Productivity—output/Man year	T	..	5·4	6·3	7·1		7·0	

ANNEXURE XII-B

Performance of Foundry

Sl. No.	Item Description	Unit	Standard or design figures	1963-64	1964-65	1965-66	1966-67		
							I Qr.	II Qr.	III Qr.
1.	(*a*) Production of Ingot Moulds & Bottom Plates	T	20,320	31,408	31,227	32,429	6,881	4,391	5,710
	(*b*) % of rejection	%	..	4·1	11·6	10·7	..	17·1	..
	(*c*) % achievement on rated capacity	%	..	155%	154%	160%	..	113%	..
2.	(*a*) Production of miscellaneous iron castings	T	5,004	1,370	1,569	1,920	423	312	416
	(*b*) % of rejection	%	..	7·8	13·5	15·5	..	16·7	..
	(*c*) % achievement on rated capacity	%	..	27	30·1	38	..	31	..
3.	(*a*) Production of Steel Casting	T	5,004	607	682	939	175	124	147
	(*b*) % of rejection	%	..	2·0	4·0	7·9	..	10·7	..
	(*c*) % achievement on rated capacity	%	..	12	14	19	..	12	..
4.	(*a*) Production of non-ferrous castings	T	300	95	131	132	27	14	21
	(*b*) % achievement on rated capacity	%	..	31·66	43·6	44	..	28	..
	(*c*) Total men on roll	Nos.	..	700	700	700	..	700	..
	(*d*) Productivity—Output/Man year	T	..	47·8	48·0	50·6	..	35·4	..

ANNEXURE XIV-A

Purchase & Consumption of Spares & Stores

(Fig. in lakhs of rupees)

Description	1963-64		1964-65		1965-66		1966—Dec. '66	
	Purchase	Total consumption	Purchase	Total consumption	Purchase	Total consumption	Purchase	Total consumption
1. Belts	22·18	19·56	26·35	27·56	12·22	22·13	16·73	13·08
2. Rolls	48·15	N.A.	49·34	22·00	48·92	29·00	52·92	N.A.
3. Refractories	178·10	165·00	195·98	224·95	227·52	207·08	84·81	112·49
4. Type spares	188·00	80·00	212·14	96·96	193·82	102·42	109·83	85·62
5. Consumable spares	68·89	39·53	93·04	44·38	82·10	47·42	38·93	28·58
*6. Ingot Moulds	N.A.	N.A.	1·34	1·34	1·88	1·88	6·22	6·22
TOTAL	505·32	..	578·19	417·19	566·46	409·93	309·44	245·99

*NOTE:—For Ingot Moulds—These figures represent only bought out cases and Ingot Moulds are generally being made in the Foundry.

ANNEXURE XIV-B

Setting up of an Organisation for planning and Procurement of spares.

1. *List of spares*

Cataloguing of all spares, department and section-wise, numbering them and also giving drawing Nos.

2. *Drawings*

Collecting all drawings (department-wise) numbering them finding out what are missing and making out the remaining drawings.

3. *Spares requirements*

(a) Making list of spares received with Plants, purchased since and inventory of what are in hand.

(b) Assessing interchangeability and requirements of each and determining the maxima and minima to be stocked on the basis of fast moving, slow moving, insurance spares etc.

(c) Breaking down each item for purposes of procurement.

- (i) from indigenous sources.
- (ii) by import, but after making maximum substitution.
- (iii) manufacture by CME.
- (iv) repairs.

4. Planning for procurement of spares.

5. Storage of spares and issues.

6. *Equipment Data*

Making records in complete details, *e.g.* suppliers names, numbers etc., cost, types, details regarding size, capacity, speed, drives, parts etc. etc.

7. Service records of equipment.

Repairs done spares used etc.

8. Analysis of failures—causes etc. of failures how to prevent etc.

9. Improvement of equipment life and control on use of spares.

10. Operation and maintenance manuals and instruction sheets.

To collect supplier's manuals etc. as available and numbering and making proper records of these. To supplement these by preparing manuals etc. for the balance. An arrange safe keeping with the Department and Central Organisation.

ANNEXURE XIX-A

Hindustan Steel Limited, Durgapur Steel Plant

Yearwise Comparative Statement of Budget Estimates and Actual Performances

(Rs. in lakhs)

Particulars	1964-65 Budget			Actual	1965-66 Budget			Actual	1966-67 Budget		
	Original Budget sanction	Original Estimate approved	Revised Estimate		Original Estimate	Approved Budget	Revised Budget		Original Estimate	Approved	Revised
Sales Income .	6662	6662	6766	6220	6538	6539	6950	6547	8476	8511	5300
Other Income .	41	41	05	100	100	..	92	95	99	..	93
(A) TOTAL INCOME	6704	6704	6761	6321	6638	6539	7043	6642	8576	8511	5393
Expenses											
1. Consumption of raw materials	1987	2027	2131	1911	2050	2020	1874	2077	2315	2386	1757
2. Consumption of Stores & Spares	542	542	470	593	510	510	650	573	750	750	548
3. Salaries & Wages	761	600	630	697	675	716	865	891	951	934	885
4. Purchase of Power & Fuel	120	120	95	94	95	95	110	108	130	Incl. Maint. & Repairs Column	96
5. Excise Duty .	829	829	841	758	817	818	1038	968	1389	1382	757
6. Maint. & Repairs .	82	117	206	141	130	130	164	142	192	376	189
7. Freight outward	538	538	566	498	524	525	515	564	655	651	429
8. Insurance .	..	..	..	..	..	..	55	45	85	85	N A.
9. Misc. expenses	197	145	137	190	249	192	222	198	243	142	296
10. Interest .	554	554	512	512	512	514	514	515	514	514	564
11. Depreciation.	954	954	950	1174	950	1250	1200	1197	1375	1375	1260
12. Stock Acretion	(—)15	(—)15	70	(—)224	36	37	24	(—)317	..	..	149
Less other Accounts .	..	..	..	(—)70	..	..	..	(—)91	..	..	..
B. TOTAL EXPENDITURE (NET) .	6552	6414	6619	6268	6552	6807	7233	6873	8602	8595	6634
C. PROFIT/LOSS (A—B) .	(+)152	(+)289	(+)249	(+)53	(—)86	(—)268	(—)190	(—)231	(—)25	(—)84	(—)1242

GMGIPND—Job II—5 Steel & Mine M.—1320—15-7-67—1,200.